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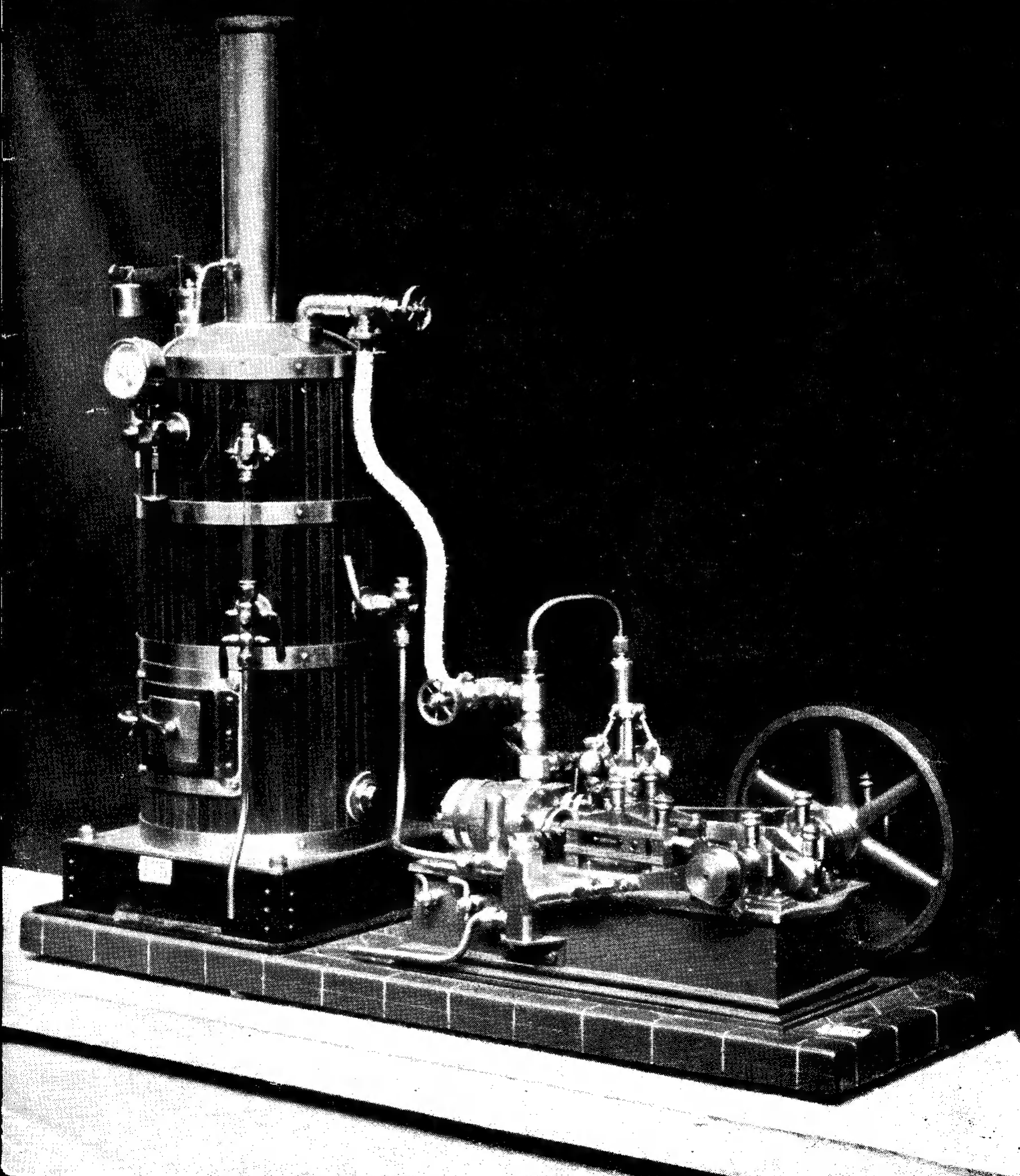
THE MODEL ENGINEER



The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

5TH APRIL 1951

VOL. 104 NO. 2602

SMOKE RINGS

Our Cover Picture

● IN THE early days of model engineering, the stationary steam plant, not necessarily built to any prototype design, but simply intended as an exercise in construction, and as a motive power for driving other mechanical models, was extremely popular, and the great majority of beginners undertook something of this nature for their first effort.

Within recent years, however, interest in this type of model has declined, possibly because of the fact that comparatively few small or medium powered steam plants are seen in domestic or industrial installations, where they have been almost entirely supplanted by the electric motor. The merits of a straightforward model of this type, however, still deserve attention. Not only do such engines serve as a very useful introduction to mechanical work, but they also provide a good demonstration of the working principles of steam engines. We have found from correspondence that many of our readers who wish to embark on some advanced type of locomotive or marine engine have never taken the trouble to make any experiments with simpler types of steam engines, or to comprehend thoroughly the operation of the slide-valve or other essential working parts; and we have often recommended that these readers should build a simple steam plant before embarking on more ambitious projects. Technical schools might also find, in the simple steam plant, a combined exercise in mechanical craftsmanship, and demonstration in the first principles of heat engines. The particular example of a free-lance vertical boiler and engine which we illustrate was built by Mr. W. W. Beale, of Bath, and was shown at the 1948 "M.E." Exhibition.

The Third N.A.M.E. Annual Exhibition

● THE THIRD annual exhibition of the Northern Association of Model Engineers was held at the Corn and Produce Exchange, Manchester, on March 16th, 17th and 18th, and showed once more that our hobby is at least as great a force in the north as it is anywhere else in Britain. No fewer than 32 stands displayed not only examples of the work of the association's members, covering every phase of interest, but many trade products and supplies, relevant books and magazines as well as certain allied crafts.

Our impression was that, this year, the exhibits were quite as numerous as at previous N.A.M.E. exhibitions, but the general quality seemed better than before. The model aircraft section was the strongest, numerically, followed by the general, marine and locomotive sections, in that order.

Altogether, these contained about 200 separate exhibits, most of them entries for the various competitions; the loan section added at least as many more items, adding up to a thoroughly representative show on which everybody concerned deserves warm praise.

Kodak Veteran Retires

● WE LEARN that Mr. George Badger, shop superintendent of the Kodak Society of Experimental Engineers and Craftsmen, and a personal friend of all the members, has retired. At a recent meeting, he was the recipient of a presentation as a token of the esteem and affection in which he was held by all who came in contact with him.

Mr. Badger was well known to us ; on several occasions, we had had the pleasure of his collaboration when judging the exhibits at the Kodak Society's exhibition, and we admired his sound opinion and knowledge, to say nothing of his cheery, friendly company. We associate ourselves with the good wishes of his friends for a long and happy retirement.

To Press Officers of Societies

● QUITE A number of model engineering societies now have Press officers on their executives, but we are surprised to note that we seldom hear from these gentlemen. To us, it seems that the Press officer is content to send out to the Press such material as reports of passed meetings and the dates of future meetings. Very seldom indeed does a Press officer appear to think that readers of the model engineering Press would be far more interested in illustrated descriptions of work in hand by the members of his club !

We respectfully suggest that Press officers would be doing an enormous service to their fellow-members by searching out models which have been, or are being built by members, getting photographs taken of the models and sending prints and descriptions to us. THE MODEL ENGINEER circulates all over the world, and provides the ideal means of interchanging ideas and information among many thousands of interested readers, not to mention the wide publicity this would give to the clubs. So, wake up, Press officers !

More Newspaperese

● THE FOLLOWING quoted paragraph is taken from a newspaper report of a recent iron and steel exhibition held in the provinces : " One of the many intriguing things to see . . . is a model electro-magnet which operates at the push of a button. The magnet symbolises the whole show, for the exhibition is meant to attract the best type of youth into the steel industry."

In a whole column of report, that is the only reference to this apparently wonderful magnet, and we are left wondering as to just what its significance really is. We would have thought that almost any type of electro-magnet could be made to operate at the push of a button ; the reporter, however, would seem to be unaware of this simple fact, though perhaps there is a bare possibility that he has never seen an electric bell !

Until we can have more information about this particular magnet, we hold to our opinion that most of the youths, we know, have years ago discovered nearly all the mysteries of electro-magnets which can be operated at the push of a button, and something more impressive would be required as an attraction !

More Locomotive Prodigality

● WE HAVE received a letter from Mr. R. W. Nash, hon. secretary of the Hayes and Harlington Model Engineers Society, who has lately been convalescing after a painful illness and taking the opportunity of going through some of his back numbers of THE MODEL ENGINEER.

He came upon the note headed " The Popular Locomotive," published in our issue of September 21st last, and he thinks that his society's record can beat that of Brighton, because 26 of his members are responsible for a grand total of 37 locomotives.

This gives a ratio of members to locomotives slightly exceeding 1 : 1.4, and while we are not at the moment, able to state the precise ratio for the Brighton society, we know that the Blackburn Live Steamers can beat it with a ratio of 15 members to 24 locomotives, or 1 : 1.6. This was noted in a paragraph in " Smoke Rings " for November 23rd last, and we would like to know of a society which can beat it.

These Forgetful Querists

● WE REGRET that we should feel obliged to raise an old complaint, once more ; but the number of readers who send in queries to be answered through our Queries and Replies service is increasing. So is the number who forget to observe our simple request that a stamped addressed envelope should be sent with each query !

We do not think that this is an exhorbitant request, in view of the service given—most of it without charge to the querist. After all, our request for the s.a.e. is not merely to save us postage, but more particularly to ensure that the querist shall not have to be kept waiting a matter of months until the reply to his query is published. We frankly admit that we look askance at letters that ask for information but contain no stamped envelope for the reply. Many of the queries that we receive often involve considerable time spent in framing the reply, and we think that this fact alone is enough to justify our request.

R.A.F. Model Makers in Difficulties

● WE WERE interested to receive a letter recently from Group-Captain R. F. Shenton, who is stationed at Singapore. He tells us that there is a small model engineering society at the R.A.F. station there, and he hopes to see the membership grow as time goes on. There is also a very flourishing model aeroplane club which has produced some fine models, most of which are flying ones.

In that tropical place, the greatest handicap is the very high humidity of the atmosphere, which destroys glued joints in a very short time. We imagine that the only solution to this problem is the use of one of the non-hygroscopic glues or cements, if such are to be obtained in Singapore. But even these may possibly be affected by the prevailing combination of intense heat and damp, making the lot of the model aircraft constructor tiresome to a degree that we, in Britain, never know.

However, we hope that all the members of those R.A.F. clubs in the Singapore station may be able to enjoy many happy hours at their hobby, in spite of the difficulties.

SOME NEW ZEALAND MODELS

(*Photographs by T. G. Palmer, Whangarei*)

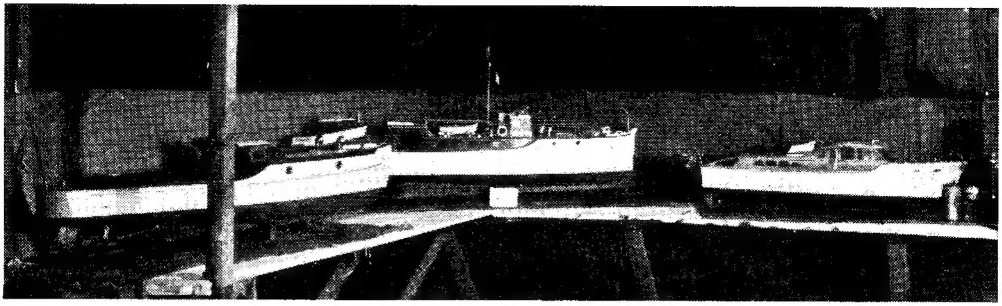


Photo No. 1

AT Whangarei, New Zealand, there is an Agricultural and Pastoral Society to which is attached a section that is devoted to model engineering, and the members of that section would seem to be able to hold their own with the best. Evidence of this is clear from a number of photographs we have received from Mr. J. W. Taylor, who is secretary of the section. It has not been easy to make a selection from the photographs, since all of them show work of very high standard; but we decided to choose prints which would reproduce well in our pages, rather than try to pick out the really outstanding examples of workmanship. The photographs were taken at the 1950 exhibition held by the society, and may be taken as representative of the members' enthusiasm and skill.

Well Organised

The organising of the exhibition was well carried out, particularly so far as the model section was concerned; the models were arranged in a space about 60 ft. by 40 ft., stands being built up by the stewards of the section, and exhibits were collected from places up to 150 miles away. One of the principal features was a tank, about 15 ft. long and 9 ft. wide, having in its centre an island on which a model farm was laid out. There were several working features on the farm, including a water-wheel driven from a stream running down a hill, as well as a tractor running round a field. The farmhouse was fronted by lawns and miniature flower gardens.

At one end of the island stood a lighthouse with flashing light, and a stern-wheeler steamboat was travelling on the water round the island. A pilot came out of the base of the lighthouse to signal the stern-wheeler as she passed, and then returned inside after the boat had gone!

Around the outer platform of the tank was a double-track "OO"-gauge railway, complete with stations, goods sheds, signal-boxes, engine shed, etc.; on the outer track ran a goods train, while a passenger train was operating on the inner track, the whole controlled from one control panel.

Powered by Steam!

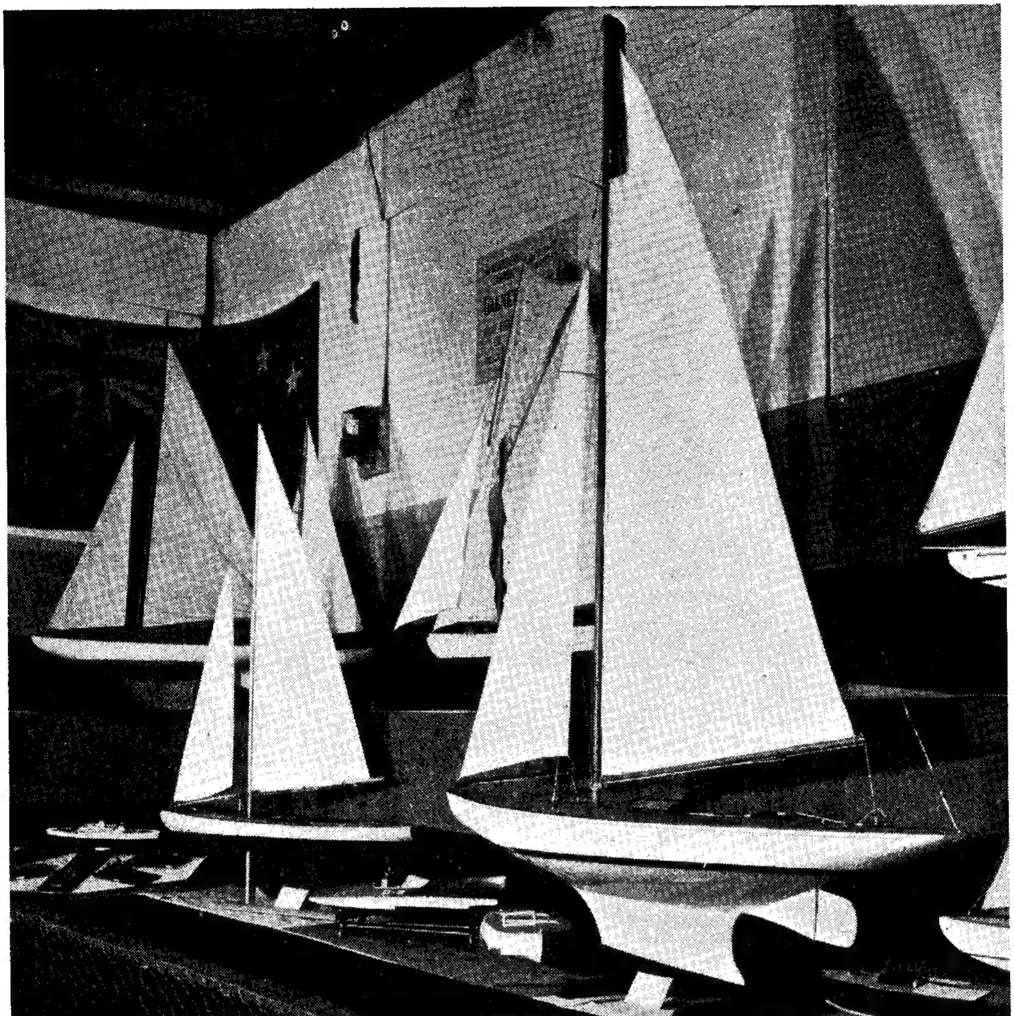
A small boiler provided steam for working a selection of steam engines [A distinctly logical feature!—ED., "M.E."] and several windscreen wipers had been adapted to run other working models. Incidentally, the model stern-wheeler steamboat was driven by a motor which, with a different winding, had once done duty in a car horn!

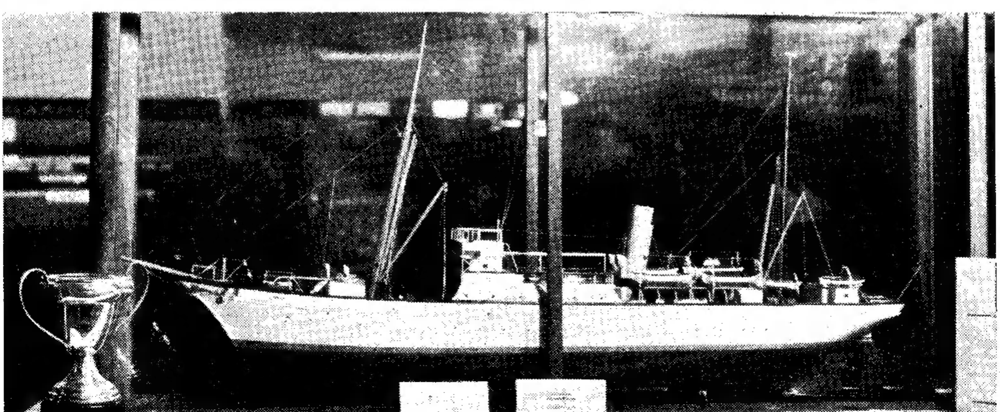
In another part of the stand, a model aeroplane, having a wing-span of 4 ft. 6 in., was going round on the end of an arm driven by an electric motor. Another interesting and heartening exhibit was a collection of examples of different kinds of handiwork by the pupils of Whangarei Boys' High School.

Photo 1 shows a trio of nice, neat launches; *Photo* 2, some pleasing yachts together with one or two speed-boats. *Photo* 3 shows a model that is of rather more than usual interest. It is a model of the steam yacht *Hinemoa*, the prototype of which was built at Carlsdyke, Scotland, in 1876, for the New Zealand Government; the model not only won the Championship Cup at the exhibition, but is dedicated to the men who served in the surf-boats of *Hinemoa* during her 30 years of service as a lighthouse tender around the New Zealand coast, 1892-1922.

Photo 4 shows a fine horizontal marine boiler together with a number of engines of different types, including a fine beam engine.

Photo 5 depicts an interesting double-Fairlie locomotive for $1\frac{3}{4}$-in. gauge. This is electrically driven and is the work of our old friend Mr. F.





Above—Photo No. 2 and Below—Photo No. 3

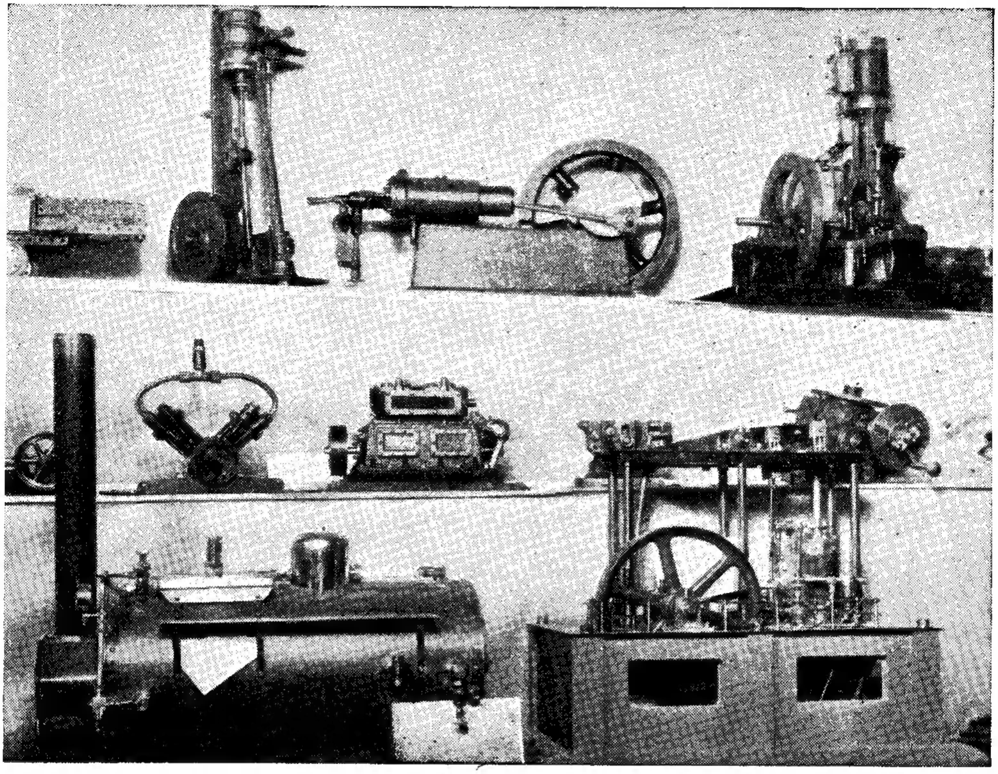


Photo No. 4

Roberts, who says it is the last model he will make. He is 67 years of age and feels he wants a rest in retirement. [Incidentally, we are sorry that when we quoted his age not long ago, we inadvertently transposed the figures.—ED., "M.E.".]

We are pleased to have been able to display this necessarily brief record of model engineering activities in the farthest Dominion of the Commonwealth. Obviously, the enthusiasm and skill are there, and we have no doubt the good work will be kept going.

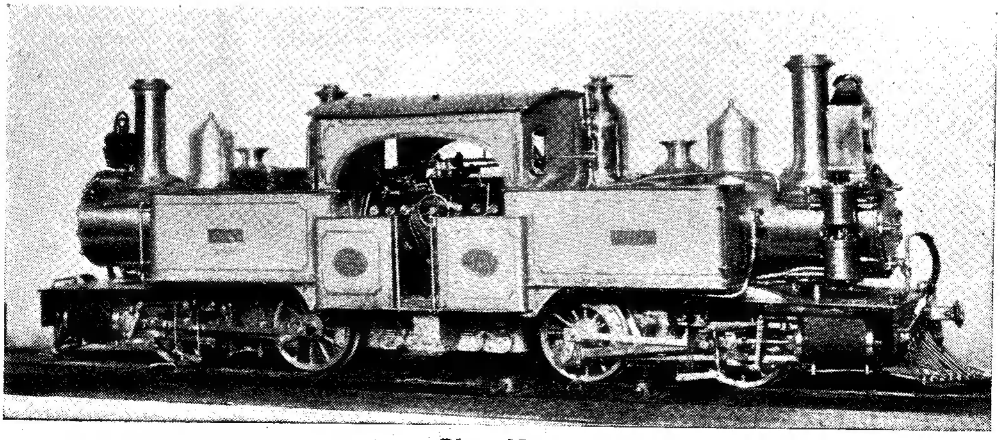


Photo No. 5

A "Three-Cylinder" Electric Motor

by A. D. Stubbs

IT all came about because a small friend of mine had been given a toy electric motor for his birthday. Apart from the dubious satisfaction of watching the sparks from a very poor specimen of a commutator, the motor was a wash-out.

His idea of power is something to drive the sewing machine or the food mincer, so I simply omitted any representation of a driving pulley, but set out to give him something to watch and to play with.

From one end he can see the three pistons popping in and out, but the main attractions are, of course, the three connecting-rods and cranks, with the three switch-operating eccentrics wobbling around. One lever gives him "ahead-off-astern," and the other "stop-quarter-half-full." There is no flywheel, because the momentum would have seriously slowed down the response of the motor to change of control.

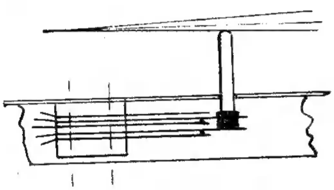


Fig. 2

Fig. 1 shows the finished job. The design started with the three solenoids, and having determined the diameters and decided that they should lie in line, the crankshaft more or less designed itself. I wanted the three eccentrics together, and to avoid increasing the overall width of the toy they just had to take the place of an intermediate bearing. The intermediate bearing just had to be there to fill the space on the crankshaft, so there it is; but I will be perfectly frank and say that mine is 1/64 in. large in the bore. In other words, it is purely ornamental.

Each cylinder is double-acting. Each switch tappet passes through the baseplate, and contacts the insulated arm of a Dewar double-pole double-throw switch, shown dotted in Fig. 1, in detail in Fig. 2, and diagrammatically in Fig. 3. One switch alone is shown here, the remaining two being wired in parallel from the open circle points, their wiring to the other two solenoids being similar to the one shown.

When the eccentric is up, the switch occupies the position shown in Fig. 3, and the crank is vertically upwards. The piston is drawn into the solenoid until the revolving eccentric depresses the tappet and reverses the Dewar switch. This energises the other half of the solenoid, and attracts the piston on its reverse stroke.

My model will operate on a 4-volt accumulator, but works off a 12-volt mains transformer. The solenoids can naturally be wound for any consumption. In the hollow base of my motor there are two car lamps as resistances, mine being wired in series, giving a very slow "slow" speed, which was only achieved after the thing had been well and truly run in; but of that more later.

Fig. 4 gives the crankshaft details. When I die, the word "Crank" will be found engraved on my heart. When you and I meet at Calais, or where machinists go, we can have a chat about it. Having acquired a piece of 1¾ in. diameter steel, 5¼ in. long, I very carefully set out the seven centres at each end, and centre-drilled the lot, the idea being that I could change from centre to centre without trouble.

The next step was to hacksaw out three blocks,

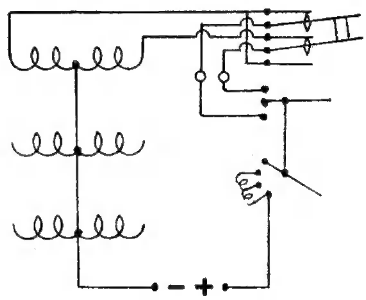


Fig. 3

leaving the embryo crankshaft looking more or less, and mostly less, like the end view of Fig. 4. The eccentric centres are shown in Fig. 5, then rightly or wrongly, I decided to finish the crankshaft progressively, from the tailstock end, nearest the eccentrics.

The 5¼ in. length gave me ¼ in. surplus at each end. These ends were left on until the very end of the job, as they gave me my various centres. Starting at ¼ in. from one end, I hacksawed the three ribs down almost to journal diameter, and chain drilled each piece out. This enabled me to turn the outer journal and the side of No. 1 crank arm.

After this, the process continued along the shaft almost automatically but packed with interest. Having cut out the waste for No. 1 crank, I changed over to No. 1 crank centres, wedging a piece of oak in the gap between the crank arm and my centred tailstock spider. This oak blocking must be carried right along the shaft as each section is cut out.

The 1/16 in. recesses between the eccentrics were cut with a piece of broken hacksaw, used as a parting tool, in a most useful holder which I made up a long time ago.

The rest is almost "mass production," until the last journal is turned. All the edges of the

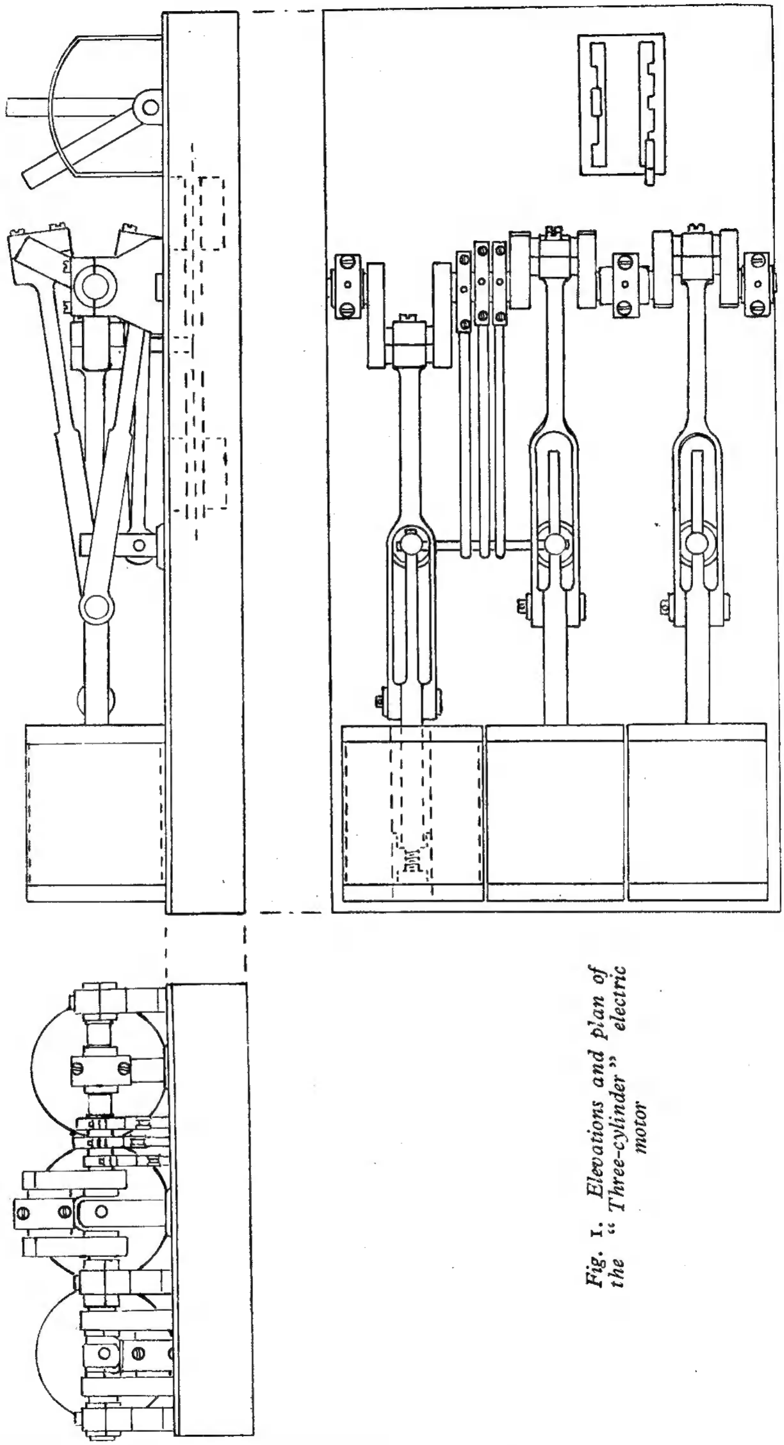


Fig. 1. Elevations and plan of the "Three-cylinder" electric motor

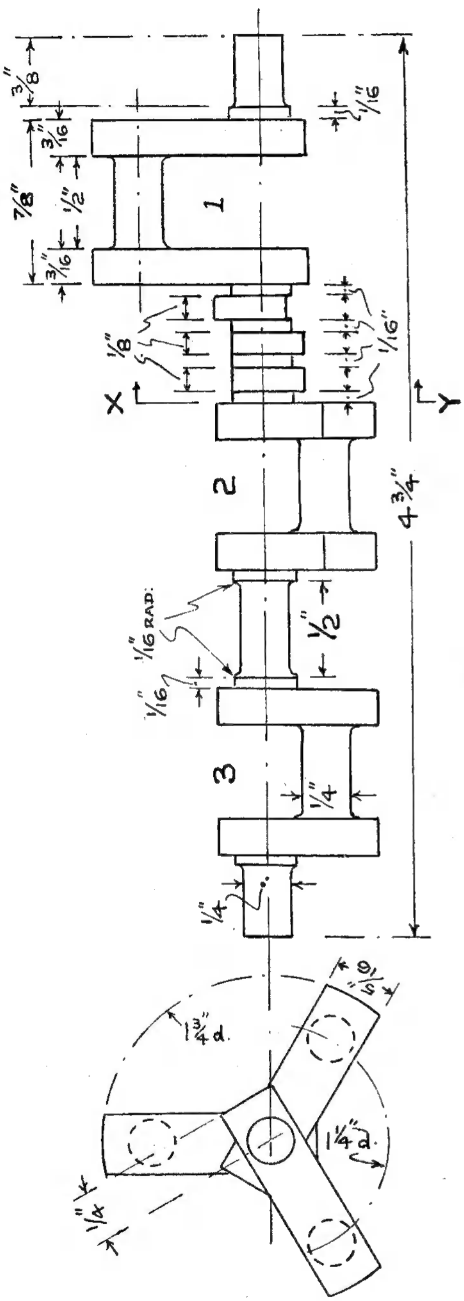


Fig. 4

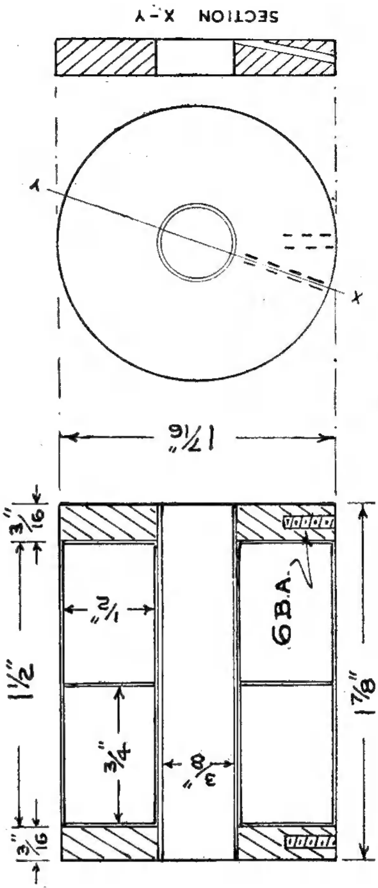


Fig. 6

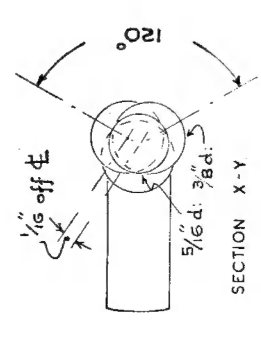


Fig. 5

crank arms were machined with an end-mill, and finally my centred spiders were cut off, and the ends of the journals faced, using a steady on the actual journals. A good many machine hours went into this little job, which was really interesting. Incidentally, the headstock spider was not cut off quite as quickly as it sounds. Having no pulley to enable me to "run in" the motor, and very little power to enable the motor to do the job itself, I cut the last spider down and turned the spare $\frac{1}{4}$ in. into a vee pulley.

When assembled, the motor was definitely too stiff to run under its own "steam," even after a little judicious scraping, so I belt drove it on the temporary pulley from my lathe motor until the bearings were run in, and later turned off the pulley.

Completion of the three solenoids, Fig. 6, will confirm my centre height of 23/32 in. The point here is that if you radically alter my windings, your diameters may be greater or lesser than mine, in which case all six bearing standards, and possibly the recesses in the baseplate which clear the big-ends, will have to be altered to suit.

For the centre tube, which I wanted to be as thin as possible, I used brass tube, sold as fishing-rod joint connections, brass end-plates being soldered to the tube. In Fig. 6, end view, you will see alongside the 6 B.A. tapping, a hole from the periphery to near the centre. This is shown also in the section. It is drilled $\frac{1}{16}$ in. at an inward angle, to come out at the outside diameter of the centre tube, its object being to carry the inner end of the winding out, through the baseplate (see Fig. 7) *via* one of the nine $\frac{1}{16}$i-n. holes drilled therein, to the Dewar switch below. Every end-plate is similarly drilled.

To wind the two half coils independently, I turned up a $1\frac{1}{2}$-in. softwood cylinder with a $\frac{7}{16}$-in. hole, the cylinder being $\frac{3}{4}$ in. long, cut it down the centre and wired the two pieces on one half of the solenoid tube. Before commencing to wind, cover the exposed brass tube with three layers of paper. Three paper circles, $\frac{7}{16}$ in bore, $1\frac{7}{16}$ in. diameter, with a cut from periphery to centre to enable you to fit them in position, are wanted for each end of the wiring. Shellac or paraffin wax all three layers in position, then prick out the $\frac{1}{16}$-in. wiring hole in the solenoid end-plate.

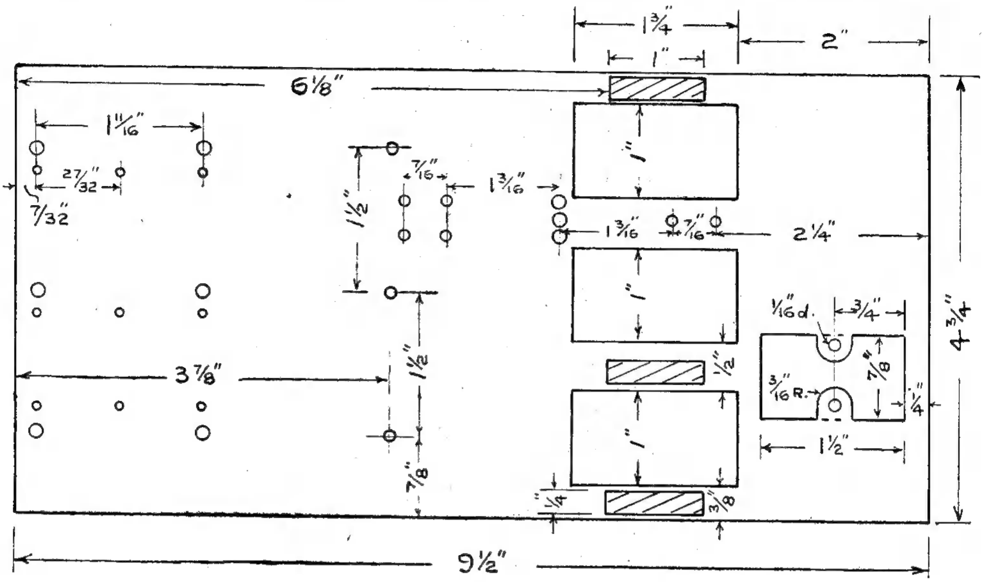


Fig. 7

On each half solenoid I wound 620 turns of No. 28-s.w.g. double silk covered instrument wire. This was produced from an old motor field coil which I had by me, and really the resistance is rather low. A motor repair shop is a useful source of supply. Slip a length of sleeving back into the end-plate hole after feeding the wire through the inner end, and leave sufficient spare wire outside to take you to the Dewar switch.

To wire, I mounted my field coil on a drum, which in turn was mounted on my cross-slide toolpost. This drum must rotate freely, then a little thumb pressure can give just sufficient resistance to give an even wind, the other helping the wire to run on evenly. If you have not previously wound a coil on the lathe, start off with your lowest backgear until you get the knack of it!

Having completed one half coil, tie the whole with a few turns of thread, then soak the winding in melted paraffin wax, or with shellac dissolved in methylated spirit. Let the coil set, then remove the two halves of the wooden block occupying the space for the other half coil, and proceed to wind that one.

(To be continued)

Capture Those Curves

With a Simple Contour Follower

by "Cepheus"

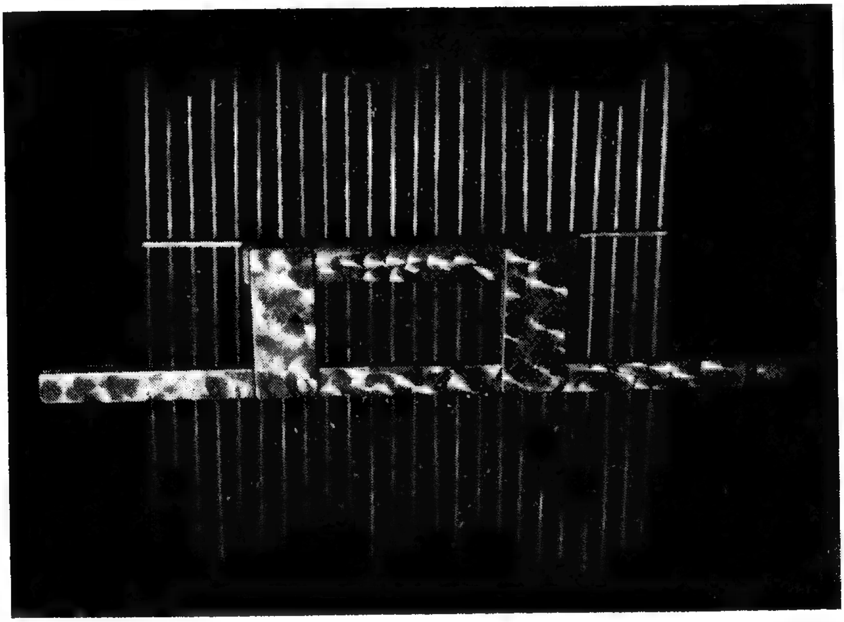


Photo by] [*R. White*

Fig. 1. A device for forming boat curves

BOATS mean curves; and curves generally mean accurate cutting to templates. This takes time, especially when templates or deck houses, etc., have to be cut to fit another curve. Hence the little device shown in Fig. 1.

In use, the instrument is held near the work, and the sliding rods pressed down until all are in contact with the surface, or over the drawing, as the case may be. The rods are adjusted so as to be a stiff sliding fit in the bar of the tool beforehand. This is to obviate the necessity of touching the tightening screw again, which would perhaps distort the rods slightly from their true position.

The curve obtained on the rod-ends may then be transferred to paper or wood, and the transferred points joined by a smooth curve, or alternatively, the instrument itself can be used as a template.

Construction

An exploded view of the construction is given in Fig. 2. The actual clamping blocks are made from brass or duralumin bar, $\frac{3}{8}$ in. × $\frac{1}{4}$ in. section, drilled for the rods at centres required, and split through the holes. Drawn channel can be used for the slide, but it must be an exact sliding fit over the clamping blocks. It is easier to make the channel oneself, and get the right size to begin with. A strip of about 22-gauge brass is bent over a $\frac{3}{8}$-in. × $\frac{1}{8}$-in. brass bar and soldered in position (Fig. 3). The solder fillet left in the corners of the channel can be scraped out afterwards with a graver. A $\frac{3}{4}$ in. length of bar at one end of the slide houses a strong steel spring (Fig. 4). The amount of spring tension is governed by a 4-B.A. screw bearing against the end of the housing. Bronze wire, $\frac{1}{8}$ in., was used in the original for the contact rods, but brass would have done just as well, and would have been easier to straighten.

The rod guide above the main slide is made and attached after the rest of the instrument is completed. It is marked out for centres by the projecting ends of the rods themselves. Needless to say, the points of the rods must be withdrawn as close to their clamps as possible for this operation. The guide, when drilled, is positioned on the instrument and sweated to the $\frac{3}{8}$ in. × $\frac{1}{8}$ in. retaining bar.

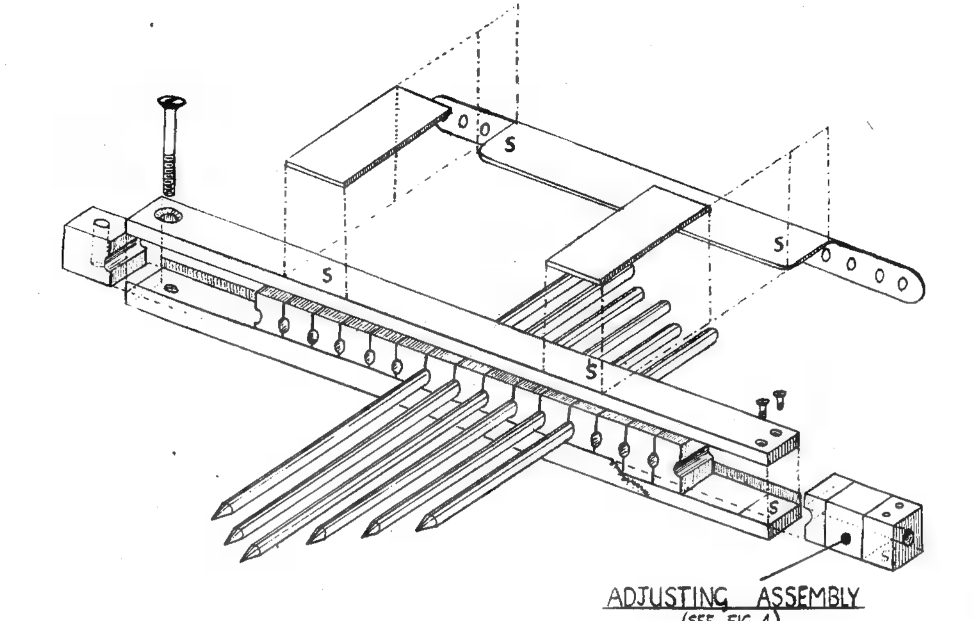


Fig. 2

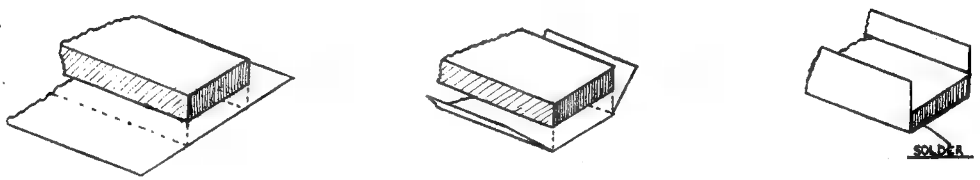


Fig. 3

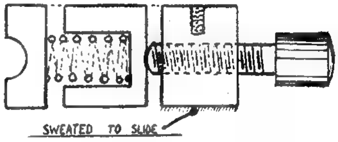


Fig. 4

The final finish on the original was made with a disc of abrasive, cemented to a piece of wood, and revolved in the drill. The result looks pleasing, and what is more, the completed instrument has well proved that the time spent in its manufacture has not been wasted.

Prototype Model Steamers

Most model engineers can appreciate a good model of a steamship or, in these days, of a motor vessel. Many would like to " have a go " but are bewildered at the immense variety of types from which to choose and so, in the end, they do nothing at all. The availability of a suitable sailing water is also at times a deciding factor, but if the urge is there and the modeller is undecided as to which type to adopt, he will be well advised to attend one of the numerous regattas to be held during the season, where the Nomination Race and the Steering Competition are entirely for prototype models. In the one, scale speed and general seaworthiness are the deciding factors, and success in the Steering Competition proves that the model will sail straight and true on its course. The types of models to be seen range from the battleship, cruiser and destroyer, the liner and the cross-channel packet, to the paddle steamer, M.T.B., cabin cruiser and, occasionally, the old-fashioned steam picket boat.

In its way a model steamer is quite as satisfying as a locomotive. In fact, the relationship is very close in that it carries with it a complete power plant, boiler, burner, engine and usually boiler feed water and oil pumps. As such, it is a worthy subject for any model engineer, especially as the problem also entails the design and construction of a hull and its superstructure, not to mention the numerous deck fittings which give variety and interest to the work of construction.

IN THE WORKSHOP

by "Duplex"

86—*A Fine-Feed Gear for the $3\frac{1}{2}$-in. Drummond Lathe

THE compact form of control mechanism fitted to the fine-feed gear, described in the previous article, adds greatly to the convenience of working, and it will be found that by its use the saddle [redacted] be traversed [redacted] few thousandths of an inch at a time without danger of over-running the required amount of saddle movement. Moreover, it will be evident that, because of the light driving pressure on the gear teeth concerned, disengage-

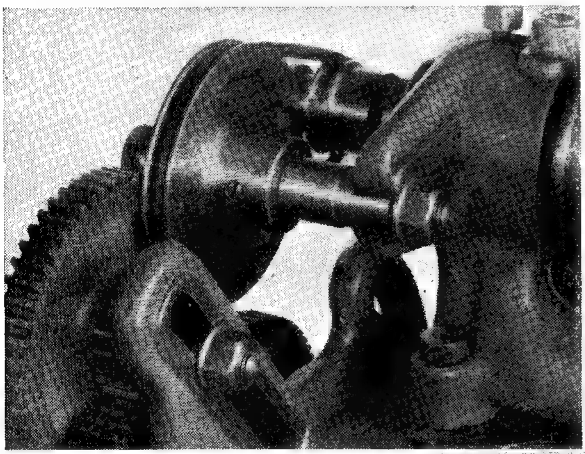


Fig. 6. The simple form of feed-gear

ment of the drive will need no more than [redacted] touch of the finger on the small control lever. When, however, the saddle feed is disengaged by opening the leadscrew half-nut, much greater operating pressure will be necessary to overcome the friction between the parts when under load. On these grounds, the control mechanism described has obvious advantages; but, for those who [redacted] satisfied with the standard method of controlling the saddle feed, the fine-feed gear itself can be adopted and the special control mechanism omitted. When this is done, the attachment is modified in the way shown in the accompanying illustrations.

The large belt pulley is similar to that already described, but the gear wheel, driven by it and mounted on the [redacted] spindle, is an ordinary change wheel retained in place by means of the standard plug fitting. This arrangement makes alteration of the rate of feed [redacted] very simple matter, [redacted] all that is necessary is to change one standard change wheel for another. The spindle or stud, Fig. 8, on which the belt pulley and gear wheel [redacted] carried can be machined from [redacted] length of $\frac{5}{8}$ in. diameter round mild-steel, and, to locate the pulley and also to afford it [redacted] bearing shoulder, [redacted] detachable sleeve is fitted to the spindle. Where it fits in the reverse stud lug on the headstock, the spindle is formed with two flats and is secured in place with a nut and washer.

A Direct Drive from the Countershaft to the Feed-Gear

When milling [redacted] part held in the lathe chuck by using [redacted] milling spindle mounted on the saddle, the lathe mandrel is locked and remains stationary while the saddle is traversed to feed the milling cutter along the work. With this arrangement, it is [redacted] great advantage, especially when cutting gear teeth, to use [redacted] automatic feed which will not only

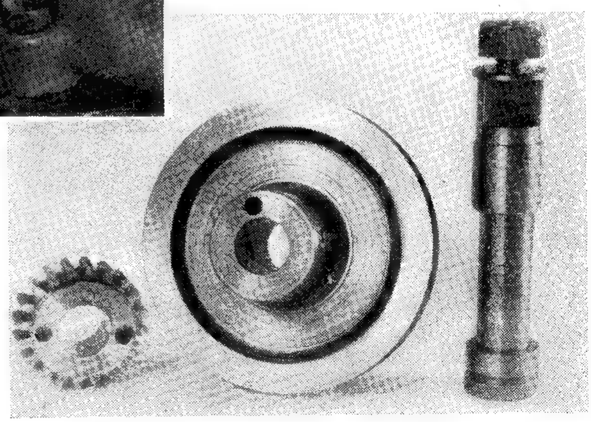


Fig. 7. Parts of the feed mechanism

save the trouble of hand-feeding, but will also help to ensure regular and even machining.

For this purpose, as illustrated in Fig. 9, [redacted] length of sewing-machine leather belting is used to connect the small cone pulley, attached to the end of the countershaft, to the larger belt pulley forming the first stage of the fine-feed mechanism. To provide [redacted] greater range for the adjustment of the belt tension than can be obtained by merely sliding the pulley spindle in the jaws of the reverse

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*Continued from page 384, "M.E.," March 22, 1951.

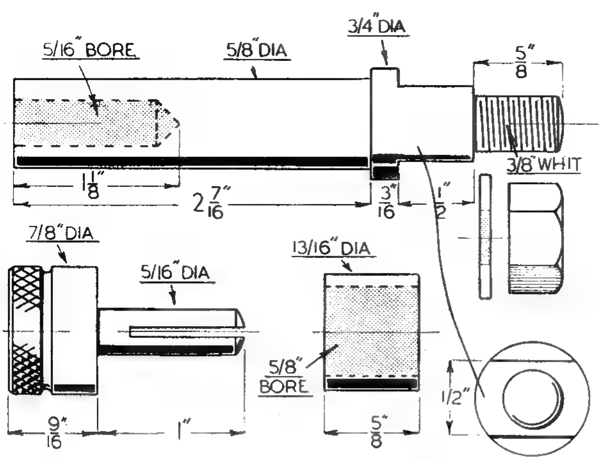


Fig. 8. The pulley spindle

stud lug, a jockey pulley is mounted on the pulley spindle, as shown in Fig. 11.

The general appearance of this attachment is shown in Fig. 12, and the dimensions of the component parts are given in the accompanying working drawings. The arm of the jockey fitting illustrated was made from a discarded cycle crank, and the head is furnished with a sliding cotter for locking the attachment after it has been swung for the purpose of setting the belt tension. When the jockey arm is mounted in place, the detachable sleeve, fitted to the pulley spindle, is removed.

The fine-feed mechanism, if fitted with the lever control gear previously described, can also carry the jockey attachment, but it will then be necessary to enlarge the bore in the body of the fitting to $\frac{7}{8}$ in., so that a piece of material larger than a cycle crank will be required to allow of this.

Where a cycle crank is used for making the body portion, the $\frac{5}{8}$ in. diameter bore for the spindle and the bore for the cotter are already formed, but it will be necessary to machine the cotter to match the curvature of the spindle by mounting the crank in the lathe with the bore set to run truly. It was found that an easy way of doing the machining was to ream the cotter bore and then, as shown in Fig. 14, to attach the crank to a small angle plate by means of a length of well-fitting rod, threaded at either end and secured with two nuts. As the cotter will then project into the bore by an amount equal to nearly its half-diameter, care is needed during the boring operation; and to avoid springing the tool, only light cuts should be taken. When the bore has been finished to size, the unwanted portion of the cotter is cut off and the end is given a slightly rounded form.

The projecting end of the jockey arm is drilled $\frac{1}{4}$ in. clearing size to take the spindle on which the jockey pulley runs.

With the pulley spindle fitted in the position in the arm shown in the drawing, the jockey pulley can also be employed for adjusting the tension of

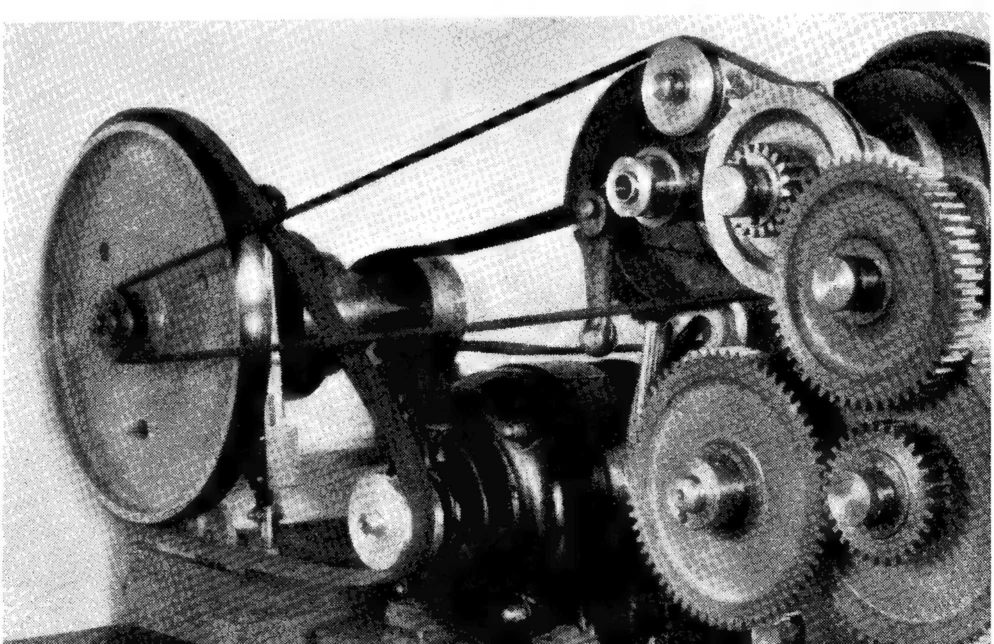
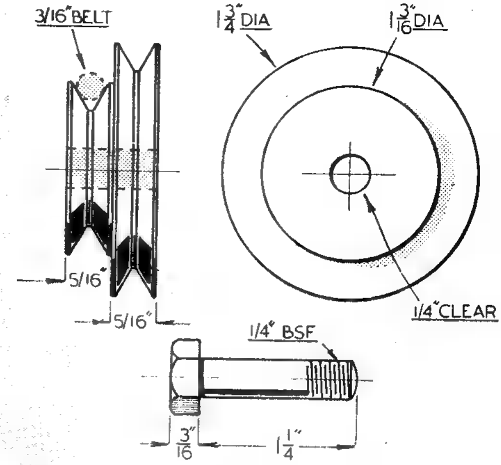
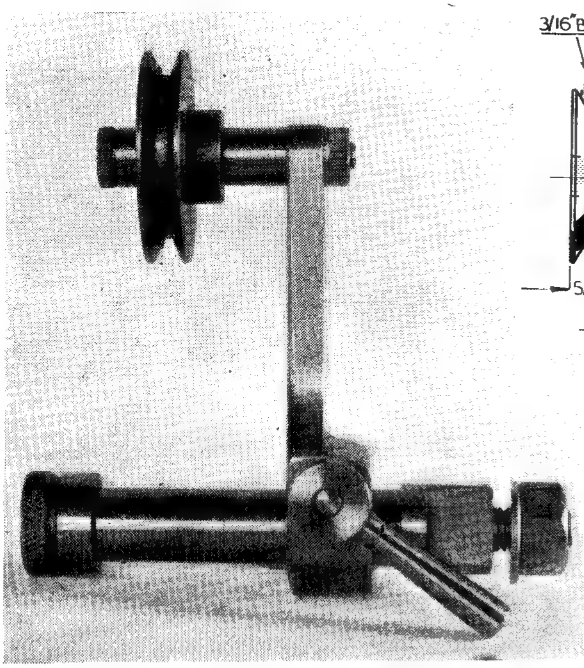


Fig. 9. The countershaft drive for the feed-gear



Above—Fig. 10. The counter-shaft belt pulley



Left—Fig. 12. The jockey fitting mounted on the pulley spindle

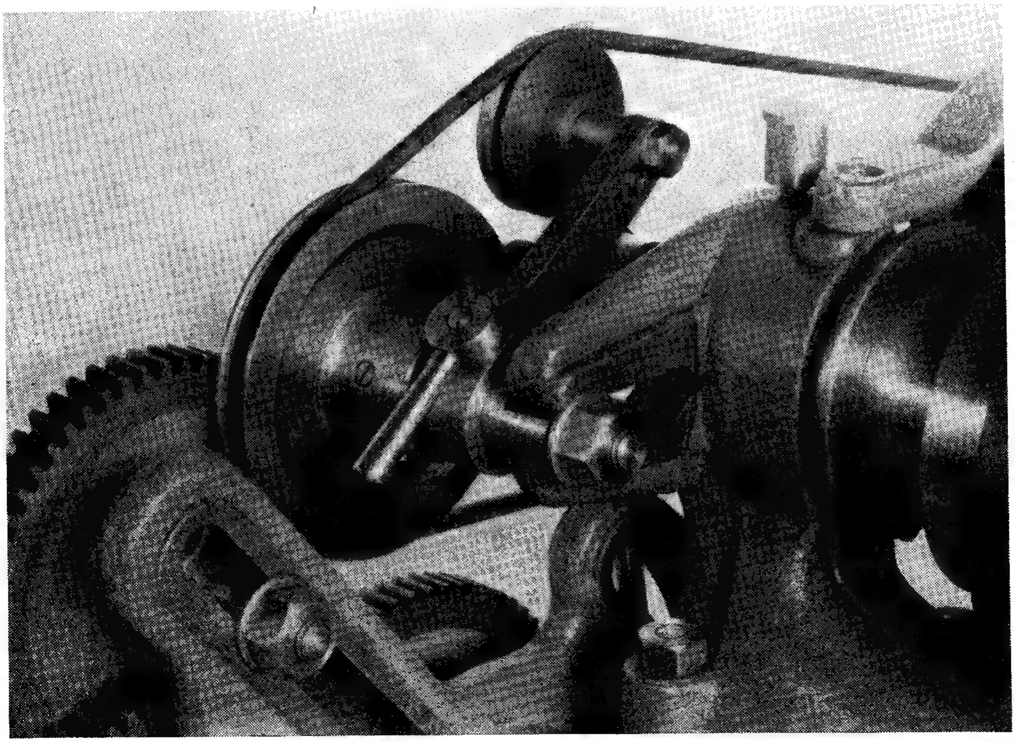


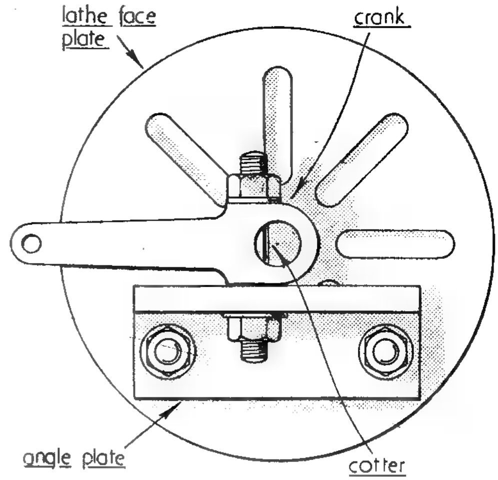
Fig. 11. The jockey attachment

the small belt used with the mandrel-driven fine-feed gear.

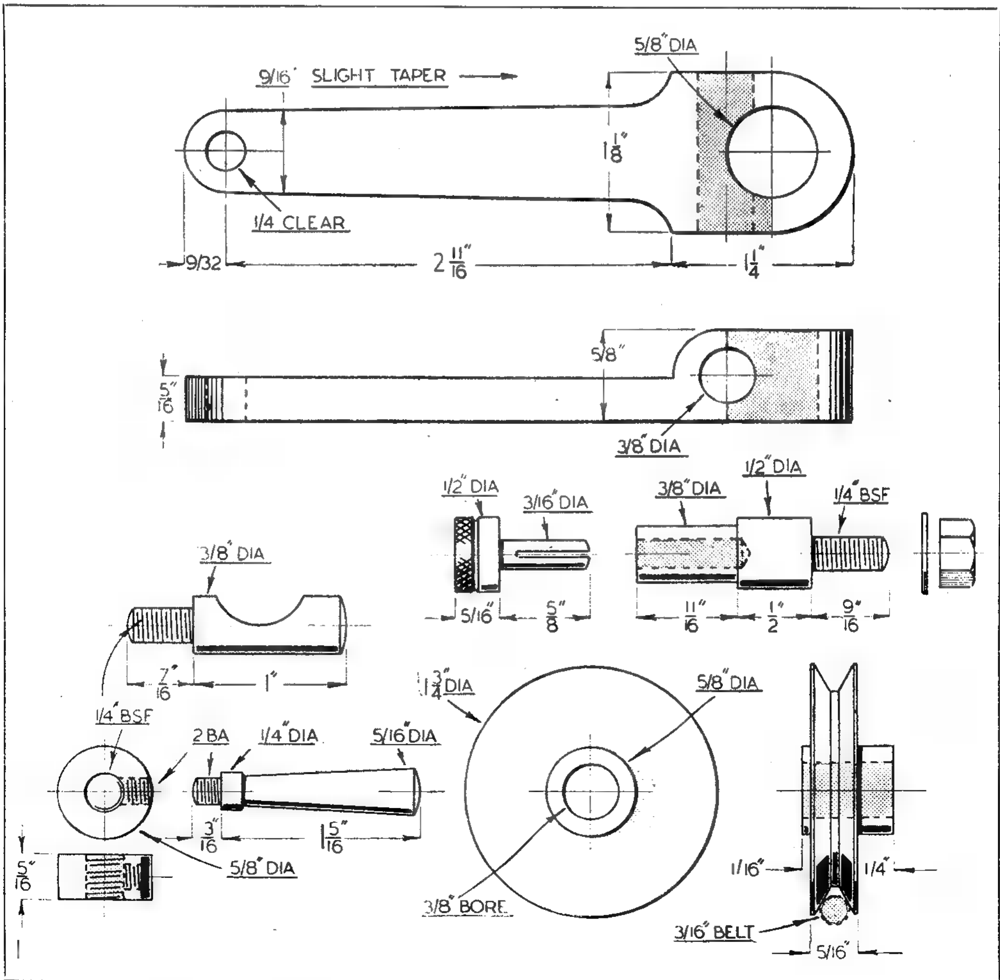
The jockey pulley is retained on its short spindle by means of ■ miniature, knurled push-plug similar to those of standard pattern supplied for securing the change wheels.

Although it may seem hardly necessary, it is, nevertheless, good practice to lap both the spindle and the bore of the jockey pulley. When this is done, quiet running is assured and there is ■ marked absence of wear, even where the parts run at high speed and are well loaded. The reason for this would seem to be that the working clearance is small, but constant, throughout the bearing and,

(*Continued on page 449*)



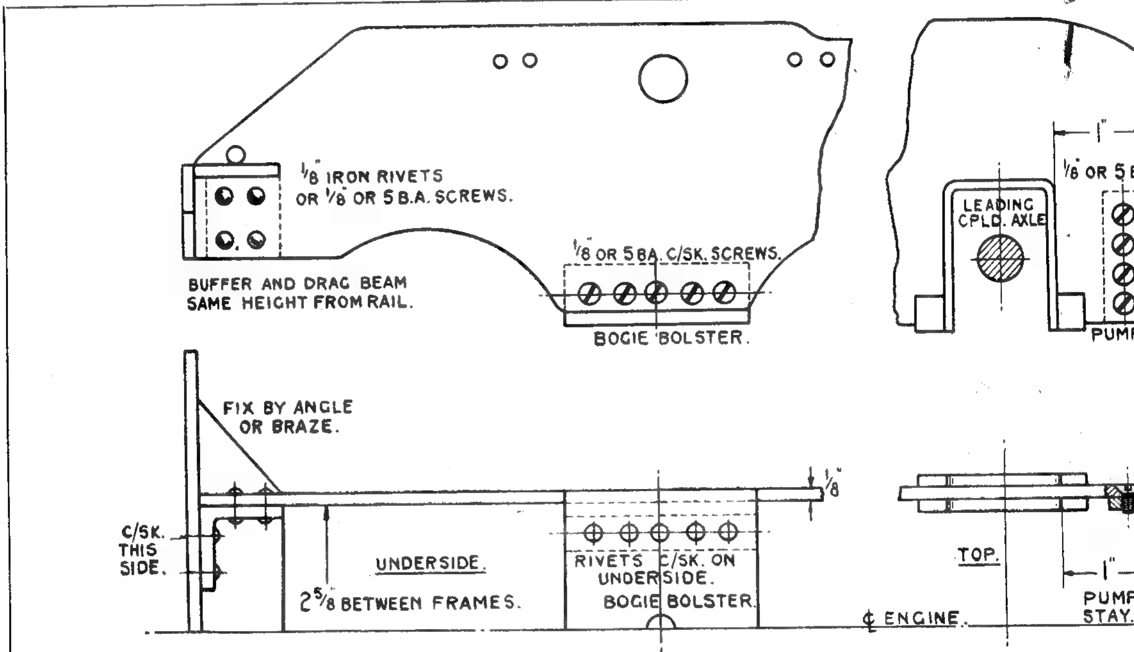
Right—Fig. 14.—The jockey arm mounted for machining the cotter



Below—Fig. 13.—The jockey arm; the cotter lock and the jockey pulley and spindle

"Britannia" in 3½-in. Gau

THE bogie bolster on the full-sized engine is a hopper-shaped affair. If anybody wants to see exactly what it looks like, there is a picture of one of the engines, in course of construction at Crewe, slung up by an overhead crane, on the cover of the February issue of *British Railways Magazine*. The bogie has not been fitted; and the bolster, complete with bogie pin, is fully exposed to view. What is suitable for 4 ft. 8½ in. gauge isn't always the most suitable for 3½-in. gauge, and vice versa; as I have explained before, I follow the example of a full-size C.M.E. by designing my component parts according to their size, and the job they have to do. The hopper-shaped bolster wouldn't fit in with my bogie, so I have substituted a flat one; and the long sides only need smoothing with a file. The shorter sides will need milling or planing, to form a true step and contact face. If a regular milling machine isn't available, the job can be done by mounting the bolster on the lathe tool holder, and traversing it across a ⅝-in. end-mill or slot drill held in three-jaw. *Modus operandi* is the same as described for axleboxes on



How to erect the

size, shape and dimensions of same, you'll find in the appended illustrations. This bolster may be either built up, or a casting; if the former, all you need are two pieces of ½-in. × ⅛-in. angle, 2 in. long, a piece of ⅛-in. steel plate (same stuff as used for frames) 2⅞ in. long and 2 in. wide, and a few 3/32-in. charcoal-iron or soft steel rivets. Square up the piece of plate, see that it is absolutely flat, and rivet a piece of angle at ⅛ in. from each shorter edge. The angles should fit nicely between the frames; not loose enough for the bolster to drop out of its own accord, before being screwed in, nor tight enough to have any tendency to spread the frames.

A casting may be used if desired; two at least of our approved advertisers should be able to supply them. The angles will, of course, be cast on, and reinforced with ribs as shown. The *Tich*. As the bogie pin is separate, it won't be a very difficult job to mount the casting at the right height, with pieces of packing if required. The underside of the casting may be faced off by mounting it in the four-jaw chuck, and using a round-nose tool set crosswise in the rest. Either type of bolster has a 9/32-in. hole drilled in the middle, for the bogie pin; the latter will be illustrated along with the sliding-block centre of the bogie.

Frame Stays

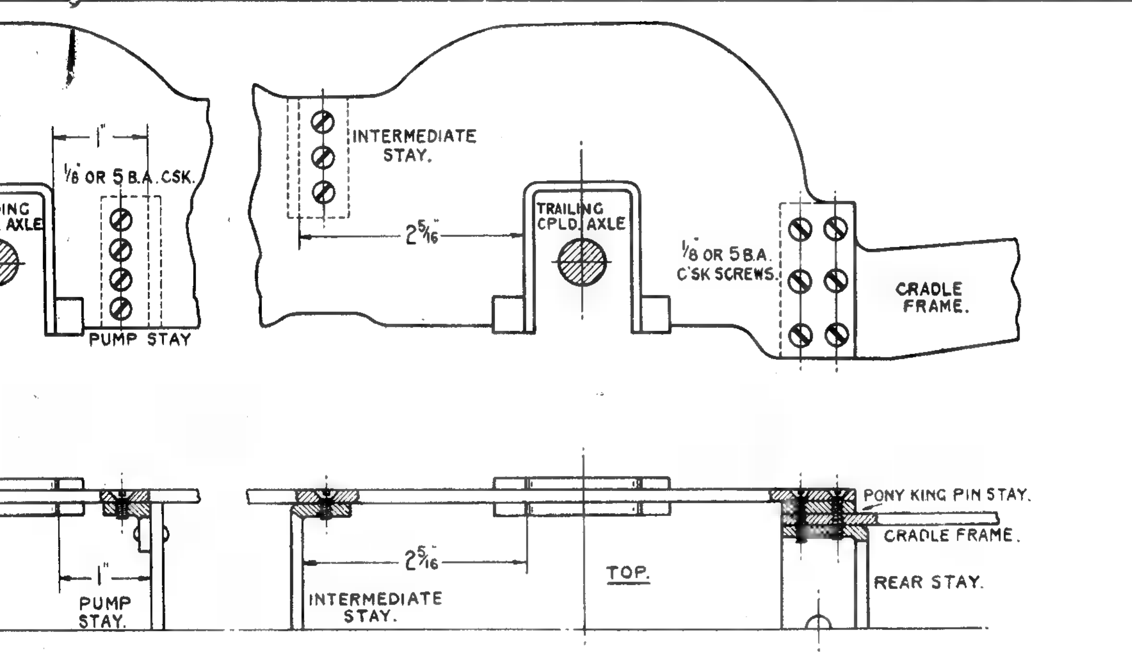
Two frame stays will be needed; the front one will carry the pump, if one is fitted. Builders have three alternative types of stay from which to make their choice. As I stated previously, I made up my frame stays from odd pieces of ⅛-in. steel plate, cut to required width, and bent to channel shape on my Diacro bending brake;

n. Gauge by "L.B.S.C."

but anybody using the bent-up stays, can easily do the needful, with ■ little care, in the bench vice. Both the pump stay and intermediate stay are made up in the same way. For the "bent-ends" job, two lengths of $\frac{1}{8}$-in. soft steel plate are needed, one $1\frac{3}{8}$ in. wide, and one $1\frac{1}{4}$ in. wide, both approximately 4 in. long. This allows for ■ little extra length on the flanges, which are trimmed to correct length after bending. Inexperienced benders had better make one bend first, then mark off the second one from it, allowing for thickness of metal, as previously described. Alternatively, from the centre of each length, mark off two lines $2\frac{3}{8}$ in. apart—this allows for thickness of metal—grip in bench vice with marked line level with top of jaw, and bend over at right-angles. The steel I used was soft and ductile; it bent nearly as easily as soft copper, with no sign of cracking. If the stuff you have is hard and brittle, it may be bent hot. As you couldn't see marked lines on red-hot metal, the second bend would need bending to a gauge; a piece of sheet metal (a bit of tin would do) cut to $2\frac{3}{8}$ in. length. Naturally, bending hot metal gives the bender no time for sleep on the job, otherwise it gets cold, but the job is not nearly so tricky as it sounds; as I have bent up lots of oddments, at various times, from red-hot metal, I can speak from actual experience. After bending, check outside measurement with ■ slide gauge, or against the angles of the bogie bolster; if O.K., trim flanges to length.

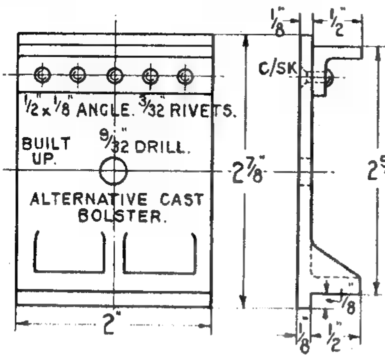
Alternative No. 1 is to cut two $2\frac{5}{8}$ in. lengths of $\frac{1}{8}$-in. steel plate, to widths of $1\frac{3}{8}$ in. and $1\frac{1}{4}$ in. respectively, and rivet pieces of $\frac{1}{2}$-in. × $\frac{1}{8}$-in. angle to the short edges, in a manner somewhat similar to the bogie-bolster, only in this case they are flush with the edge. Alternative No. 2 is to use cast stays. Only the ends will need machining off; and if a milling machine, planer, or shaper is available, the job is ■ piece of cake, merely holding the stay in ■ machine vice, and operating on it either by ■ small slabbing cutter not less than $\frac{3}{4}$ in. wide, in the case of the miller, or by an ordinary facing tool in the clapper-box of either planer or shaper. The job is easily done in the lathe, by holding the stays, short edge outward, in the four-jaw, and facing the ends in the ordinary way. Do both together, both to save time, and get them exactly the same length. They could also be bolted down to an angle-plate mounted on the faceplate, with the ends just overhanging the angle-plate, which would entirely obviate any tendency to chatter. Chattering might take place if the ends of the stays projected too far from the chuck jaws.

Drill ■ pilot hole about $\frac{3}{16}$ in. diameter, slap in the middle of the pump stay (the wider one), open it out to 35/64 in., and ream $\frac{9}{16}$ in. Drill four No. 40 holes around this, in the form of a square, $\frac{5}{16}$ in. off the centre lines, as shown in the illustration. Whether you have any intention



to erect the frames

of fitting the pump, or relying on the injectors alone, it is advisable to drill these holes. It is only [redacted] few minutes' work, and at some future time, the pump may be desirable ; it is [redacted] good insurance against trouble, if the engine is ever likely to be handled by inexperienced drivers, youthful or otherwise. It *can* happen !—during the railway strike of the early 'twenties, the son of a high railway official, an engineering student, volunteered as [redacted] driver, and started away from



Bogie bolster

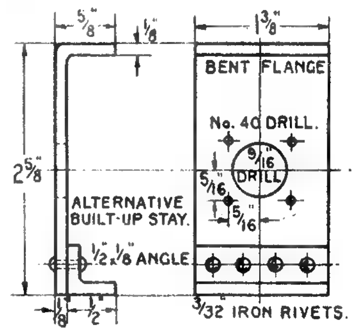
Marylebone in great style. He got as far as Neasden before he remembered that the boiler needed water ; and by that time the damage [redacted] done. Luckily the crown sheet didn't collapse, thanks to the excellent design and workmanship put into the Robinson engines (not the " Heath " kind, I hasten to add !) but it was badly burnt, and the engine had to have a new firebox. I did not originally intend to fit a pump to my own engine, but changed my mind after one of my few personal friends, a full-size driver now retired, let one of my own engines run dry ; fortunately without damage. My boilers can " take it " as well as give it !

How to Erect the Frames

Britannia's frame assembly is such a jolly long affair, that if I drew it out full length, the drawing would have to be reduced to a ridiculously small scale, in order to get it into our pages. Incidentally, this is where the blueprints come in ; on the blueprint of the frame assembly, you'll have the whole issue shown full length and full size. If not available by the time these notes appear, they will be on sale very soon afterwards, from our offices, and one or two advertisers. To get over this trouble, I have shown the frame cut into three pieces, with the position of the stays clearly shown, also the attachment of the buffer beam and trailing cradle.

This is how I erected my own frames, and it panned out O.K. The top of the frame above the bolster, and above the hornblocks, is all one straight line ; so I put the buffer beam on the front end of the two plates, in approximately its correct position, and put the intermediate stay temporarily between the frames at the back end, with [redacted] couple of cramps over flanges and frame, to make it " stay put." The whole issue was then placed upside down on a surface-plate, and the two plates adjusted until there wasn't the faintest sign of a rock. They were also set dead parallel, by aid of [redacted] try-square with the blade through the hornblocks ; they couldn't be far out when the try-square blade made full-width contact with the hornblock jaws on both frames. The next item was to clamp the frames securely in that position, and this was done by inserting pieces of packing between the frames, above the location of the bolster and between the hornblocks. I didn't use solid blocks ; simply put sufficient flat pieces together, to make up the thickness, then put them between the frames, with [redacted] big cramp over the lot, on the outside of the frames. The rear clamps were then tightened well up, to prevent any movement there ; and finally, the buffer beam was adjusted so that it was dead square across the frame, and exactly parallel with the surface-plate, at the right height from it, that is, level with the edge of frame.

The whole assembly was then up-ended in the brazing-pan, and the buffer-beam was Sifbronzed to the frames, in the same way as described for the drag-beam at the back of the cradle. This was a quick job, [redacted] easy [redacted] soft-soldering. When the frame had cooled off at the front end, it was checked off again, and the buffer-beam found to be quite O.K. in every respect. My surface-plate not being long enough to accommodate the full-length frame, I transferred to the lathe bed. The intermediate stay was then taken away from the back end of frames, and the cradle placed in position, being temporarily secured by cramps at each side. The cradle was carefully adjusted until the drag-beam attached to it, corresponded exactly with the buffer-beam, at the same height from the lathe



Pump stay

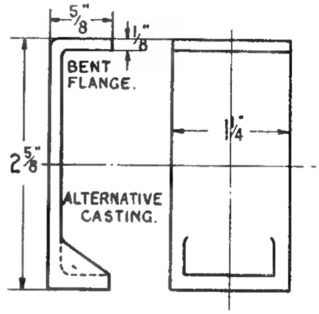
bed, and dead level. A parallel block was put under it, " to make assurance doubly sure," as the old saw puts it ; then the No. 30 drill was put through the holes in the main frames, and countersinks made on the sides of the trailing frames. The latter were then removed, the countersinks drilled No. 40 and tapped 5 B.A., clean through the three thicknesses. The cradle was then replaced, and secured by six steel countersunk screws at each side. All cramps and

packing were then removed from the frame, and it was found to be in perfect alignment all ways.

The pump stay was then set in position, flanges pointing toward the leading end of the frames, and level with the bottom edge at both sides. Application of a try-square soon set it dead square with both frames, and a cramp on each side held it in place whilst the screwholes were drilled and tapped, using the holes in main frame as a guide. Four 5-B.A. screws at each side, fixed it securely. The same procedure was applied to locate the intermediate stay, except that this one lines up with the top edge of frame. Finally, the bogie bolster was set in place and secured by five screws at each side, running through the clearing holes in the frame, into tapped holes in the angles. The net result was a frame assembly "built for the job," which would stand any amount of "rough-housing," and remain true and rigid under any conditions of service.

Alternative to Brazing Frame

As stated above, the beams on my own engine are Sifbronzed to the frames; and for a real solid honest-to-goodness job, it cannot be beaten. Those who have no oxy-acetylene blowpipe, can use an ordinary blowlamp, with Boron compo flux, and easy-running brazing strip, to fix the buffer-beam, same way as the drag-beam. Builders who prefer the angle-and-rivet construction, should first of all rivet two pieces of $\frac{7}{8}$ in. × $\frac{1}{8}$ in. angle to the buffer-beam, same as the one on the cradle. Then erect and true up your frames in the same manner as described above, or as near as you can get to it. It doesn't matter overmuch, which road you take, as long as you arrive safe and sound at your destination! Now put the beam in place, with the attached angles going inside the frames. Set it in the right position, square with the ends, and each end at exactly the same height from the surface-plate, lathe bed, or whatever you are using for an erecting table. Put a cramp over each angle, about halfway down; then drill two No. 30 holes each side, clean through frames and angles. Put a couple of $\frac{1}{8}$-in. bolts through, and nut up tightly. Remove cramps, drill the other two holes at each side, rivet up with $\frac{1}{8}$-in. charcoal-iron or soft steel rivets as shown, take out the bolts, replace by rivets, and you're through. Alternatively, use four $\frac{1}{8}$-in. or 5-B.A. bolts instead of rivets, or else drill and tap the angles $\frac{1}{8}$ in. or 5 B.A., using holes in frame as guide (in this case, the holes should be drilled at the same time as the rest of the frame holes, after marking out) and use $\frac{1}{8}$-in. or 5 B.A. set-



Intermediate stay

screws, put through the clearing holes in frame, into the tapped holes in the angles. Tip to those builders of little *Britannia* who have not had much experience; do your utmost to make a sound and rigid job of the frames; for the speed and power of the engine, when she takes the road, will give you the shock of your life, albeit a very pleasant one! Next stage, axleboxes.

Tail Lamp

Three out of every four of the good folk who have written to me about *Britannia* have spelt the name wrongly, with two teas and only one chicken! A nu kind ov spelin?

IN THE WORKSHOP

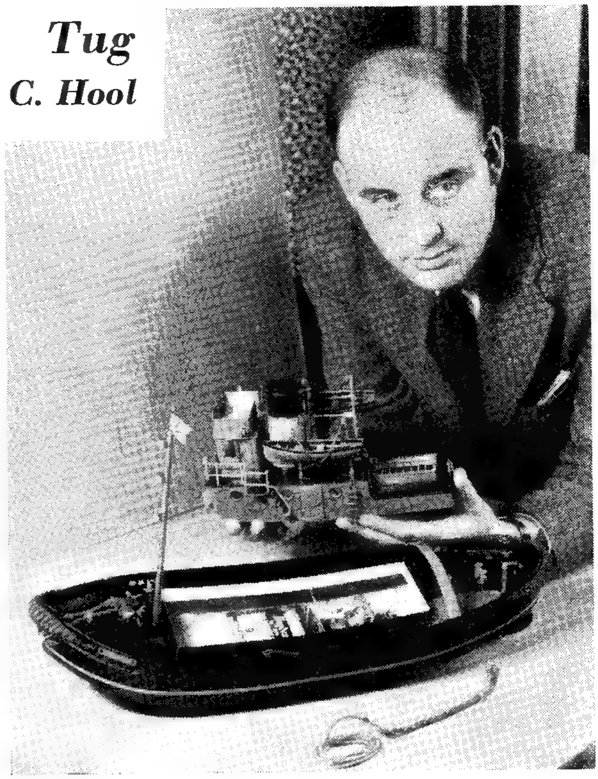
(*Continued from page* 445)

more important still, the highly-finished bearing surfaces are comparatively free from roughness and irregular projections and ridges. Under these conditions, the two bearing surfaces are at all times separated by an oil film, and metallic contact does not take place unless the bearing is overloaded.

As a case in point, the lapped bearings used in the drilling machine, described in a previous article, are standing up well to hard work. As a necessary precaution, however, the bearings of the three driving pulleys concerned are always examined after a few hours' running. When these pulleys are raised on their spindles, the oil film is invariably found to be quite clean and without any sign of blackening due to the presence of metallic particles abraded from the bearing surfaces; in addition, no bright areas have been formed on the working surfaces, such as would be seen had local metallic contact taken place.

Accurately-fitted bearings like these have the further advantage that an oil film is maintained in the bearing even when an oil of very light body is used for high-speed running. As the oil stays in the bearings and keeps clean, replenishment is only needed to renew the oil which, under working conditions, in time loses some of its lubricating properties. In this connection, manufacturers of lubricants say that it is better to remove all the used oil and give a fresh supply, rather than to add more oil to that which has already served the bearing.

The Ocean-Going Tug "Strongbow" *by J. C. Hool*

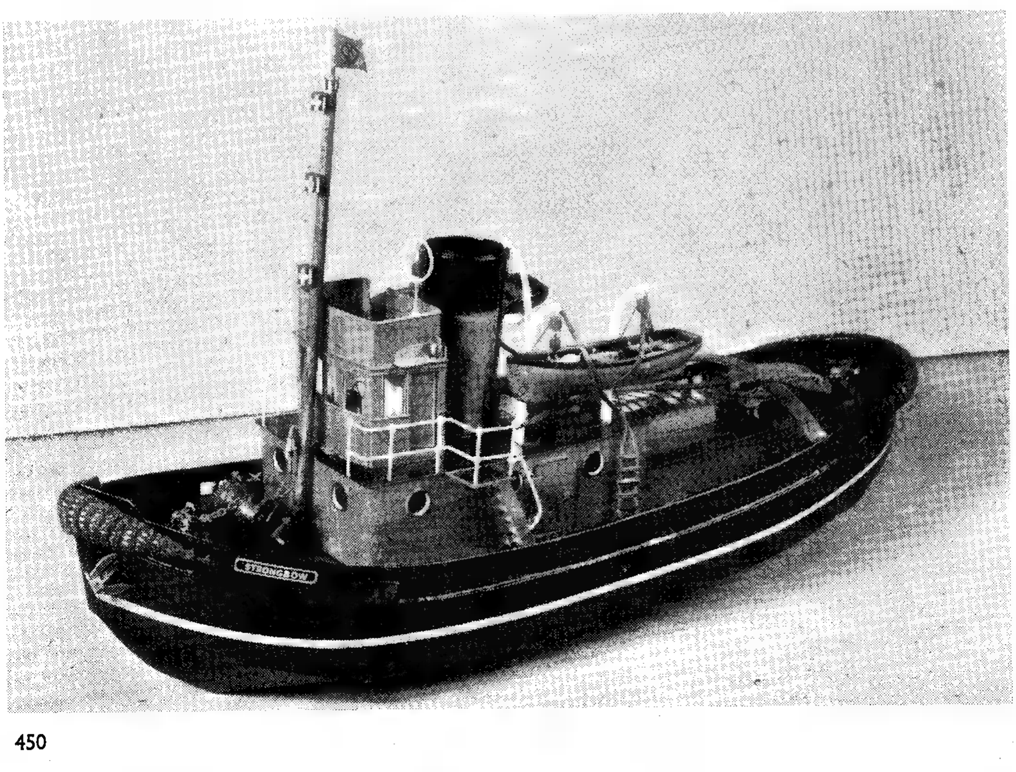


ALTHOUGH not "engineering" in the full sense of the term, I think readers may be interested in the reproduced photographs and the short description.

This model was constructed from 20-gauge tin plate, and all seams were soft-soldered. The hull is made up of one keel section cut and shaped, stern counter plate, and two side pieces. The deck was then soldered in position and capped bulwarks added. The superstructure is also constructed from tin plate.

Lifeboats were moulded on a wooden former from gummed sealing tape, using a diagonal skin construction in three layers, the final outboard layer being put on horizontally to represent the strakes of a clinker-built boat. Fittings include a working windlass with band brake, security bar for the anchor cable, tow slip hook, various tow ropes and the usual (to a layman) confusion of gear on deck. The model is powered by two $4\frac{1}{2}$-V. batteries (flash-lamp type) operating a Frog "revmaster" motor.

The photographs were taken by The Florence Studio Ltd., London.

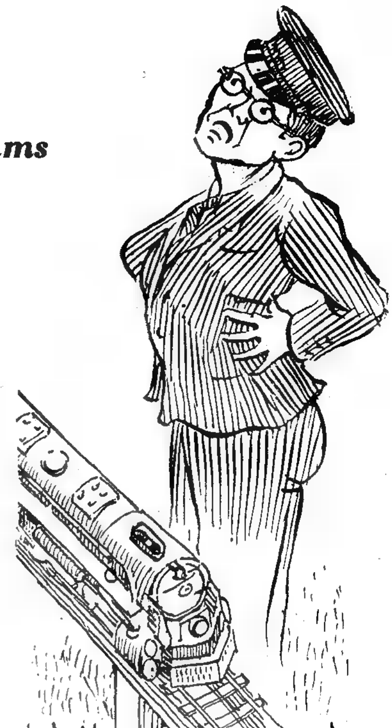


Tales of a Tyro

Draw-bar Effort — by Edward Adams

MY old Principal once said in exasperation, " Curse it Adams, why can't you let well alone." Those of us who [redacted] born with an insatiable curiosity must be very trying to our friends at times. We are for ever altering things, experimenting, asking : How ? Why ? or why not ? as the case may be.

In lifting one of the small, but heavy sisters on to the track, I felt a sudden stab in the back, and emulated the well-known, " every picture tells [redacted] story," illustration. As I was wearing a rail-waymans cap at the time, the appropriate esper-anto came naturally enough. " Small return," I thought ; " for all the work and care I have lavished on you." In passing, I have often noticed this apparent ingratitude of inanimate things.



RAIL-ROAD ESPERANTO

Now a strained back may be a painful reminder for several weeks ; ample time to ponder on the ratio between weight and draw-bar effort, for instance.

How could that ratio be reduced, I wondered. The short answer to that question is by a pinch of sand on dry rails, but that is not the way [redacted] inventor's mind works, too obvious.

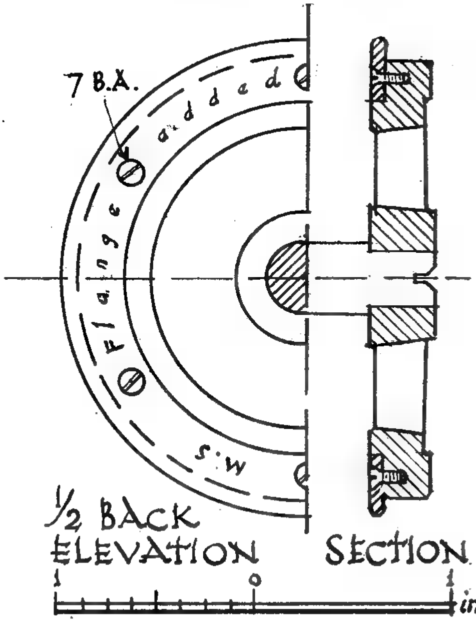
If I could increase the friction mechanically between wheels and rails, there would not be the need for all this weight, I decided.

Back again in thought to the old rack and pinion ideas. So I first tried roughening the track by filing across the rails with a coarse file, producing [redacted] miniature rack in fact, the result was no measurable improvement in wheel slip. I was sorry afterwards that I had done this ; the track soon recovered its pristine smoothness however, either by wear or the rolling action of the wheels.

Next, I toyed with the idea of increasing the pressure on the driving wheels, by cantilevering part of the weight from the passenger car. This, I decided, was practically impossible on the existing locomotives and concluded it would need an engine specially designed for the job, rather too big a task ; also, some way of varying the load would have to be found.

TOYED WITH THE IDEA

Then followed experi-ments on the treads of [redacted] spare pair of driving wheels, drilling $\frac{1}{8}$-in. holes about $\frac{3}{16}$ in. deep at $\frac{1}{4}$ in. centres around the treads, and filling with [redacted] mixture of iron cement and car-borundum dust, [redacted] variation of this was tried by turning [redacted] undercut groove in the tread and fill-ing with the same mixture. These gave a good



grip at first, but soon wore down and became ineffective.

Turning away the flange and forming [redacted] recess for [redacted] fibre tread, was next tried, [redacted] new flange being turned and screwed on from the back; this promised well, but soon became as smooth [redacted] the original tread. Incidentally, I have had occasion to add mild-steel flanges to flangeless treads, the sketch shows how they [redacted] inset and screwed on, and I would do this rather than scrap wheel castings.

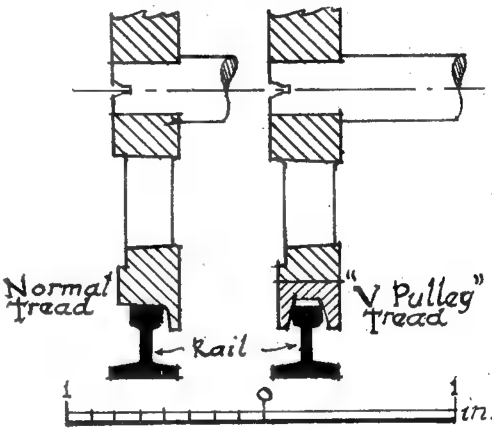
The victim for the latest idea to be tried out was 4-12-2 2-cylinder *Caterpillar*, which entailed turning away the flanges and treads of the 2nd and 5th, drivers on the right-hand side (one on each side would have been better) and forcing on a new mild-steel tread shaped like a V-pulley in which the rail does not quite bottom, the axle-box springs being made [redacted] little stronger.

Under load, these treads certainly do get [redacted] grip, at the expense of [redacted] power I shall be told. Of course the V-section could be turned in the solid wheel, if the casting was made big enough to allow for it.

The locomotive weighs nearly 35 lb., practically all of which comes on the driving wheels. At 50 lb. pressure a spring balance stalls it without wheel slip at 10 lb. draw-bar pull. At 70 lb. the wheels begin to slip and the D.B.P. varies from 14 to 16 lb., a decided improvement in pull, as before the alterations, I could get only about 8 lb. D.B.P. without excessive slipping. Wetting the rails does not seem to make any difference to the "V" grip, and derailment of the engine seems unlikely.

So I intend to try this tread modification [redacted] *Monstrous*, as she is more sturdily built and can develop much more power than she can at present use, having [redacted] "L.B.S.C." says, dustbin-size cylinders.

But truly, the way of the experimenter is hard. Have I not an old book full of sketches of ingenious mechanical devices, very many of them now



superseded and fast receding into the limbo of forgotten things?

But I like to think that their inventors got a great deal of pleasure, if little profit, in devising them; fellows who would not let well alone, and have in some measure enriched their day and generation.

For the Bookshelf

The Light Railway Handbook, by R. W. Kidner. (The Oakwood Press, Tanglewood, South Godstone, Surrey.) Price 12s. net.

Being [redacted] collection of the former separate booklets, each giving historical notes and particulars of the light railways of Britain, now brought together in one volume, it forms a handy reference book for anyone who is interested in light railways generally. The notes are necessarily brief, but the numerous illustrations, covering locomotives, rolling-stock and maps of the individual railways, are of great historical interest and, to [redacted] large extent, tell their own story.

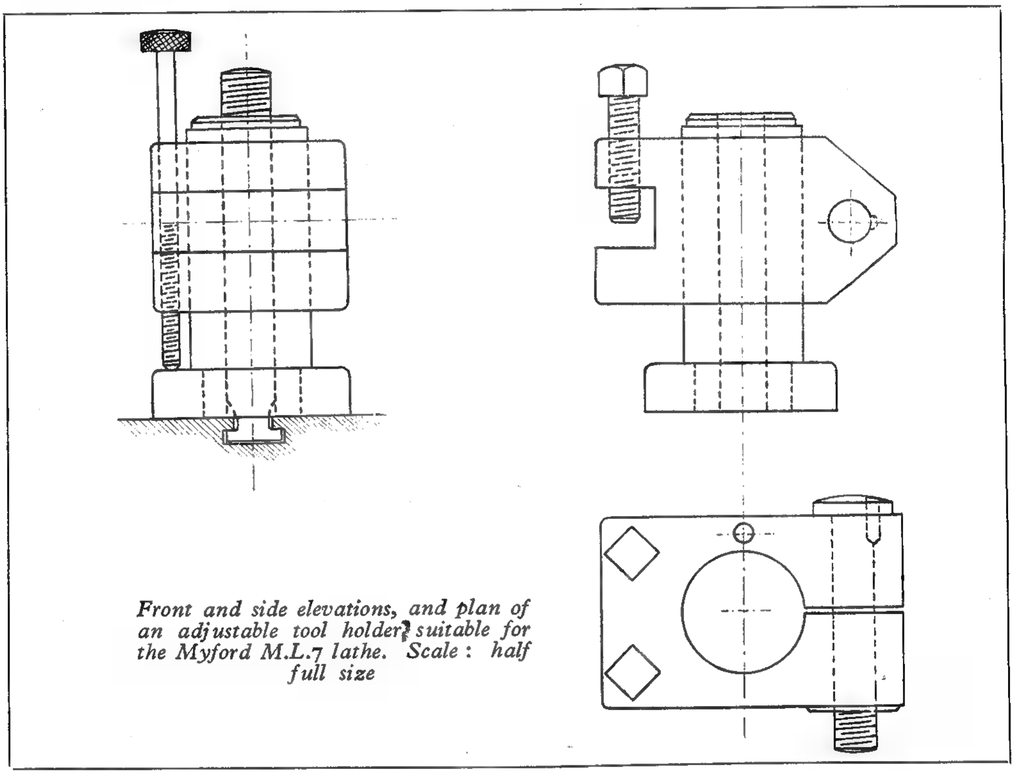
A Height-Adjusting Tool Holder for the M.L.7

by L. A. Watson

THE minds of many amateurs continue to scheme out devices for the height adjustment of tools, but [redacted] number of ideas produced are what might be called palliatives only since, in order to achieve the object desired, they play havoc with the tool angles. When the construction of a proper tool holder for the purpose is straightforward, all this is difficult to understand; and the finished article is so useful in other directions, e.g., holding work during milling operations.

The design reproduced herewith was got out for [redacted] friend owning [redacted] M.L.7 lathe, and he now reports that it is entirely satisfactory and "he wouldn't be without it." It will be realised that removal of the tool holder block leaves the pillar free to accommodate [redacted] Potts drilling or milling spindle, filing rest, etc., and no necessity to juggle with packing strips to reach lathe centre height The pillar could be turned from a solid piece of 2 in. diameter B.D.M.S., but [redacted] separate base was employed by my friend merely to use existing material. If a separate base were contemplated by the intending constructor, it could, with advantage, be another 1 in. larger in diameter. Similarly, with the tool block, [redacted] suitable piece of steel was ready to hand, but if purchasing [redacted] piece, it would probably be [redacted] in. square.

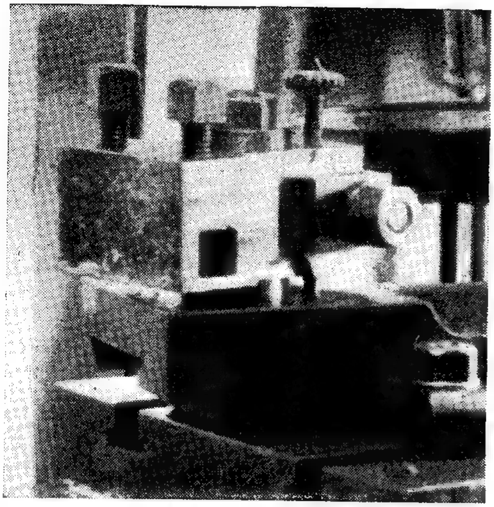
The open-sided slot is milled out with the block clamped on its own pillar at the required height; it is better, therefore, to leave this operation until the block is otherwise completed.



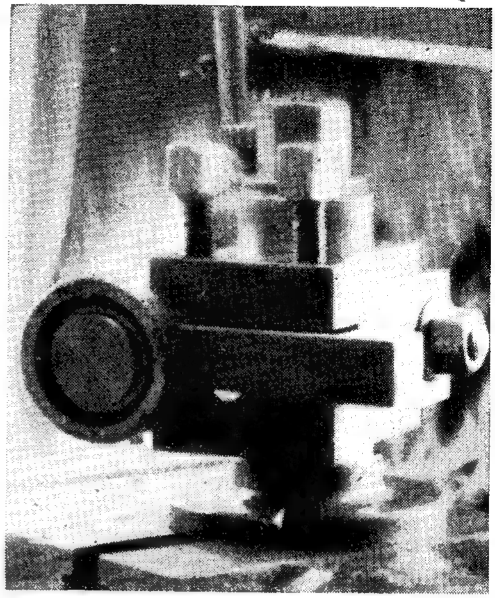
Front and side elevations, and plan of an adjustable tool holder suitable for the Myford M.L.7 lathe. Scale: half full size

The slot is shown $\frac{5}{8}$ in. wide but it will be realised that any diameter end-mill—up to about $\frac{5}{8}$ in.—can be used and the block moved up or down after the first slot is cut in order to obtain the required width. However, some time might be saved if [redacted] $\frac{5}{8}$ in. hole is first drilled through the block and the unwanted metal cut away with [redacted] saw. In milling out after this, the bottom surface especially needs to be well finished and square with the pillar.

The pillar clamping-bolt is initially an ordinary bright bolt screwed $\frac{1}{2}$ in. B.S.F. and the hexagon head is shaped [redacted] shown to engage with the tee-slots of the cross-slide. The clamping-bolt for the block is [redacted] similar article $\frac{7}{16}$ in. diameter threaded B.S.F. and the reader will note the key or pin inserted in the head and which engages



Top-slide tool holder



Cross-slide tool holder

in a half circular hole in the block. This pin should not be omitted, because it facilitates tightening the bolt without its revolving in the process. Novices may like a note on the fitting of this key.

Reduce the thickness of the bolt-head to about $\frac{3}{16}$ in. but leave it flat for the time being. By eye, make a centre-punch mark on the bolt-head in line with the edge of the shank. Insert bolt in tool block and tighten nut. Now drill down through the bolt-head for $\frac{1}{8}$ in. or so with an $\frac{1}{8}$-in. drill. Remove bolt and drive into the head a piece of $\frac{1}{8}$-in. steel rod; ordinary mild-steel will do for this, as there is no wear on the pin. The bolt may now be rechucked and the head domed.

The 2-B.A. height-adjusting screw will be noticed and this also should not be omitted, or the utility of the whole device will be impaired. A 2-B.A. tap is not long enough to tap the full length of the hole in the block but this is not necessary, and the upper half length of the hole can be drilled $\frac{3}{16}$ in. and there will be no difficulty in tapping the lower portion right through.

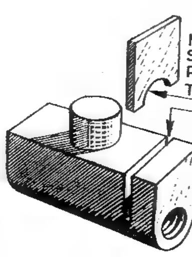
The tool clamping screws *can* be ordinary hexagon-headed set-screws but I do not recommend them because they have considerable use, and a great pressure to withstand on their ends, so it is advisable to turn these items from a piece of $\frac{3}{8}$-in. square cast or silver-steel. It is not necessary—nor advisable—to harden them, but the chamfer on the ends is important or it will be found after a while that the ends will have belled out under pressure on the tool and it will be impossible to remove the screws from the block. The thread on these screws should not be finer than the B.S.F. standard; on my own block, they are Whitworth and quite satisfactory.

The photographs reproduced with these notes show my tool holders for the top and cross-slides of my Milne's lathe. The cross-slide holder is shown carrying a ball-bearing internal lap-charger, swung round on the pillar to give a better view of the block. It will be noticed that the top-slide block is provided with a square hole, because considerations of height precluded an open-sided slot as giving insufficient tool support.

Renovating a Feed-Screw Nut

H. Burton writes :—" I have seen many useful hints and tips in The Model Engineer, and learned much from its pages; so if my own contribution is of any use to anyone, I shall feel very pleased.

" For my living I work a very rickety 6-in. lathe, which, to the best of my knowledge, was discovered when the tomb of Tutankhamen was opened. The top-slide gets a lot of work and



one day the feed nut ' gave up the ghost.' I thought of the white metal act and shuddered.

" The idea shown in sketch has worked for twelve months and looks like lasting quite a while.

" The slot was cut with a machine saw blade in a hacksaw frame, and the plate, which was $\frac{1}{16}$ in. thick to suit [illegible] t.p.i., had to be eased with a file on the corners of the hole."

TEST REPORTS

Some expert comments upon items submitted by the trade

Tools by Messrs. Offen & Co. Ltd.

CERTAIN tools of interest to all those who appreciate accurate and high-class workmanship have been submitted to us by Messrs. Offen & Co. Ltd., Kings Mill Lane, S. Nutfield, Redhill, Surrey, who are manufacturers of machine tool and measuring equipment.

The first of these tools, the Offen versatile vice, has universal movement and may be locked in any desired position on its ball-mounting by means of the hand lever seen at the base of the device in the illustrations Figs. 1 and 2, which show the vice set horizontally in the first instance and, secondly, with the jaws tilted at an angle.

The vice has removable plain hardened steel jaws $1\frac{5}{8}$ in. wide by $\frac{1}{16}$ in. deep, and is provided with complete protection for the screw, as will be observed from the illustrations.

The base, which is machined on the underside so that the vice can be mounted on the work table of a drilling machine, is an iron casting of ample size having three countersunk holes to enable it to be fastened either directly to the workbench or to a piece of hardwood which may be clamped in a bench vice.

Mounting a small vice to enable it to be held in the main bench vice offers certain advantages, particularly when fine work is being undertaken. The Offen vice is no exception ; indeed, we have found that using it in this way is most convenient when dealing with small and intricate work.

When appraising a tool of this sort, it is not practicable to apply tests for accuracy, for this quality does not enter into any consideration of the value of the device. On the other hand, the quality of the workmanship which is put into its construction must be assessed, and in this connection the Offen versatile vice appears

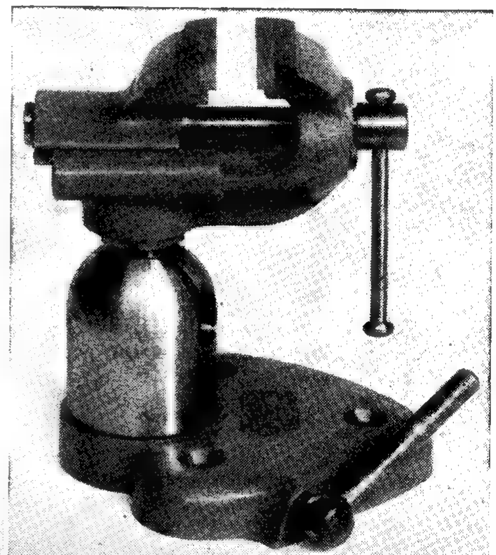


Fig. 1. (*Above*) *The Offen versatile vice*

Fig. 2. (*Left*) *The Offen versatile vice set at an angle*

to leave little room for complaint. The jaws close squarely and hold the work securely, whilst the method used for clamping the swivelling head ensures that, at whatever angle the vice itself is orientated, there will be complete rigidity.

The general finish is excellent and somewhat superior to that which might be expected, for it is uncommon to find that a hand vice has been given the attention to detail that is here displayed.

Those who need a small but rigid universal vice will find this tool excellent in every way.

The Offen V-blocks

The V-blocks made by Messrs. Offen are supplied singly or in matched pairs. A unique point in the design is the form of work clamp that is employed. As will be seen from the illustration Fig. 3, this clamp consists of a tenon-edged plate which can be engaged with any pair of slots formed in the V-block. The plate is provided with an Allen grub-screw which may be used to clamp the work firmly in place. When the usual stirrup-type clamp is used with a V-block it is impossible to invert the tool because the clamp itself gets in the way. In the Offen block the clamp in no way projects and, therefore, causes no obstruction. The V-block may then be placed on any face at will.

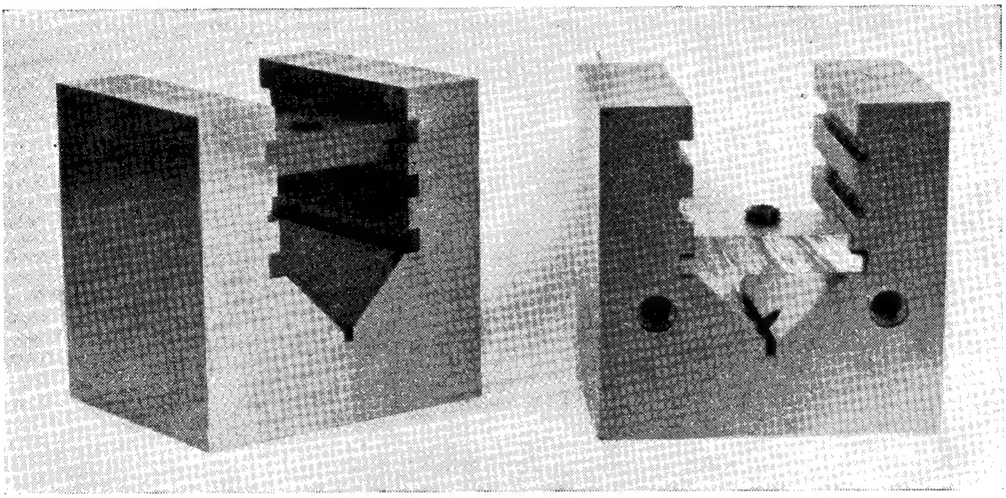


Fig. 3. A pair of precision V-blocks by Messrs. Offen, showing work clamping device

All surfaces are ground square with each other, thus enabling work to be supported either horizontally or vertically as desired.

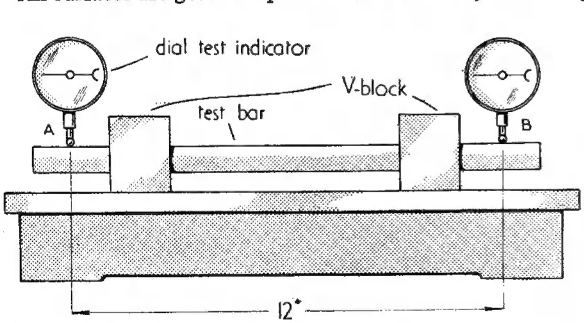


Fig. 4. Checking the work seatings in a pair of V-blocks

Surface Plate Tests

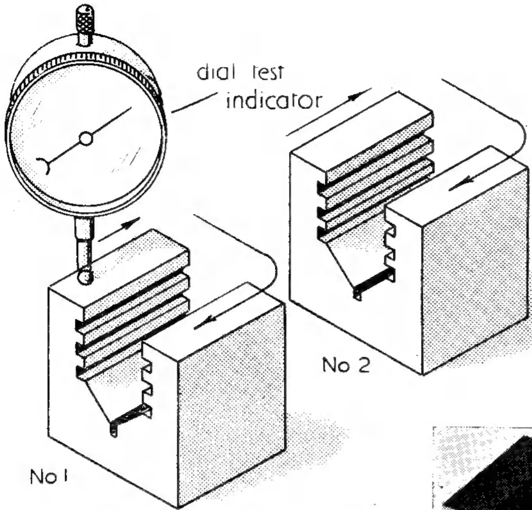
Various tests have been applied to the matched pair of blocks which were submitted to us, and in every case these tests were carried out on a surface plate of high quality, in our workshop.

In the first test a ground parallel test-bar was mounted in the blocks and a dial test indicator was applied to the points *A* and *B* shown in the illustration Fig. 4. These two points were some 12 in. apart. No difference of dial test indicator reading could be observed.

Next, the blocks were tested to determine whether they were indeed matching pairs in all other respects. This was done by checking corresponding surfaces on each block for parallelism and dimensional accuracy, the blocks being placed on the surface plate so that a dial test indicator could be applied as shown in the illustration, Fig. 5, where the parallelism of the upper and lower surfaces of the pair of V-blocks is being tested. In all these tests no differences of reading were observed, the dial test indicator showing exactly the same reading when applied to No. 2 block as that which had been obtained from the corresponding surface of No. 1 block.

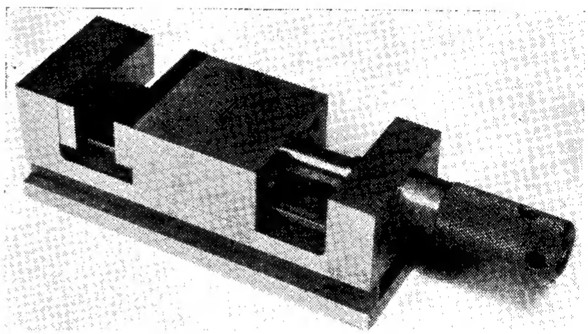
In making these tests the indicator is mounted on an Eclipse magnetic base and the V-block is moved so that the contact foot of the indicator travels in the direction shown by the arrows in the illustration. It is, perhaps, superfluous to add that absolute cleanliness of all contact surfaces is essential.

A point of some practical value should be noticed in connection with one of the blocks shown in the illustration, Fig. 3. It will be seen that a hole, ¼ in. in diameter, is formed at the bottom of the V-groove. As this hole extends right through the block, it may be used to cross-drill shafts. To use the tool for this purpose it is inverted after placing the work in position, a drill bush of appropriate size having first been made and fitted in the hole in the block, and



Left—Fig. 5. Checking a pair of matching V-blocks

Below—Fig. 6. An Offen precision toolmaker's vice



placed on the drilling machine table so that the required diameter of drill can be run into the work. Bushes made for use in this way should, of course, extend so that they make contact with the work. If they do not do so it is more than likely that the drill will wander. It is best to harden the bushes, for they may then be used repeatedly. On the other hand, a soft bush will serve in an emergency.

Examination of Fig. 3 will show that there are a pair of tapped holes formed in the vertical face of the V-block. By using these holes to attach a strap across the face of the block, a simple length-gauge may be contrived for use when cross-drilling a number of similar components. The strap itself is drilled and tapped so that an Allen cap-screw, fitted with a lock-nut, may be employed as an adjustment for length. Naturally, the precise details of this fitting will depend upon the work with which it is to be used. The making of the length gauge is, therefore, left in the hands of the actual user.

The Offen Machine Vice

The Offen machine vice, which is made in three sizes, has been designed primarily for use on the work tables of surface grinding machines. It is constructed from hardened steel, ground all over, and has a protected screw to prevent wear which would otherwise occur as a result of abrasive material from the grinding wheel finding its way into the mechanism. This protection can be seen clearly in the illustration, Fig. 6, which shows the vice submitted for test.

Precision Quality

Vices for use on surface grinding machines are usually employed in conjunction with a magnetic chuck. When no magnetic chuck is available, the Offen vice may be secured directly to the machine table by means of clamps which engage directly with the grooves seen extending around the base.

Vices which are intended for use on surface grinding machines, or, indeed, in any circumstances where precision standards are needed,

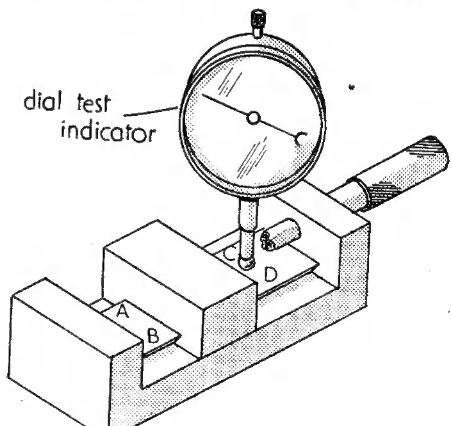


Fig. 7. Testing the work surface of a machine vice for parallelism with the base

must themselves be of precision quality, or they will be of little use.

Tests to determine the accuracy of machine vices have been described in the past, but the

methods used may not be familiar to all readers, so they will be repeated.

The first test, to establish the parallelism of the lower surface of the base in relation to the upper surface upon which work may be placed, is carried out by means of a dial test indicator applied at four points *A*, *B*, *C*, and *D*, as shown in the illustration, Fig. 7, and is carried out with both vice and indicator mounted upon an accurate surface-plate. Several sets of readings were taken at the points previously mentioned, and in no case was there any difference to be observed.

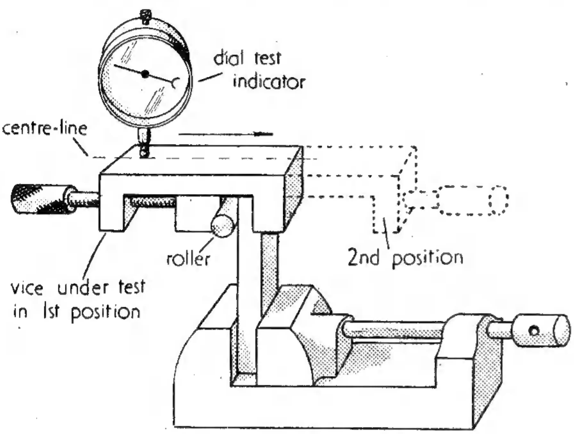


Fig. 8. *Testing the squareness of the standing jaw of a machine vice*

Squareness of Jaw

Accuracy in this respect having been established, it was then possible to proceed with the next test which was designed to establish the squareness of the standing jaw of the vice in relation to the base, a matter which is of considerable importance where machine vices are concerned. Accordingly, the Offen vice was mounted for test as illustrated in Fig. 8. A piece of rectangular mild-steel, to serve as a mounting-piece, was gripped in a machine vice placed on the surface-plate, one end of this material having, first, been machined flat and any burrs formed by the machining process removed with a fine file.

When set in the vice, the machined surface of this piece of material was set parallel with the face of the surface-plate by means of a dial test indicator.

At Right Angles

The Offen vice was then placed over the end of the steel mounting-piece with its work surface making contact with the machined face of the mount. A roller was interposed between the moving jaw of the vice and the side of the mounting-piece to ensure that the standing jaw took charge. The vice was then secured to the mount by means of its own screw. The base, now uppermost, was then painted with marking fluid and a centre-line scribed by means of jenny calipers to serve as a location on which to apply the dial test indicator at each end of the base. Readings taken showed that, as set up, there was a deviation from parallelism with the face of the surface-plate amounting to 0.025 in. The vice under test was then removed from the mounting-piece and replaced so that it occupied the second position shown in the illustration. The dial test indicator was then applied as before and an identical deviation from parallel was recorded, namely 0.025 in. As the readings of the indicator showed an increment in the same direction, it was clear, therefore, that the standing jaw of the vice was truly at right-angles to the base.

The advantage of this test is that it can be made without the use of special mandrels or fixtures ; all that is necessary is a machine vice known to have a flat base and a piece of rectangular material such as may be found in most workshops.

Contact Testing

Evenness of contact of the vice jaws is tested either by means of feeler-gauges, or two cigarette papers, which are placed between the jaws as illustrated in Fig. 9. As will be seen, the gauges or papers, which must, of course, be of the same thickness, are lightly gripped. If the jaws are parallel with each other the gauges or papers will be held with equal firmness and the same effort will be required to withdraw either of them. On the other hand, if the jaws are not parallel, one of the gauges will be held less firmly than the other. The Offen vice, when tested in this way, revealed no inaccuracy in this respect.

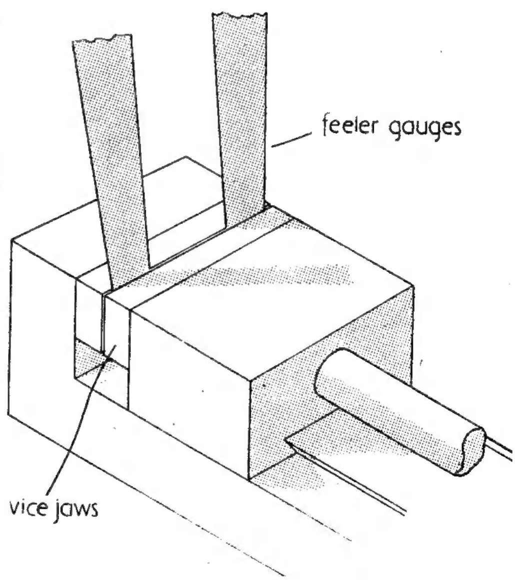


Fig. 9. *Testing the jaws of a machine vice for even contact*

PRACTICAL LETTERS

An Injector Query

DEAR SIR,—Re your note on page 222, the information required is as follows :—

In 1876 Sharp Stewart of Atlas Works, Glasgow supplied two 0-6-0 5 ft. 3 in. gauge locomotives to the Londonderry & Buncrana Railway, Nos. as given in THE MODEL ENGINEER (this later became Londonderry & Sough Swilly Railway, 3 ft. gauge).

The locomotives were S.S. works Nos. 2645 *St. Patrick* and 2836 *St. Columb.* Railway Co. Nos. 4 and 5. Cylinders 15 in. × 22 in. Wheels 4 ft. 6 in. 12 ft. 2½ in. total wheel base, 140 sq. in. W.P.

In 1885, they were sold to the Cork & Brandon Railway, Southern Ireland. In 1895-6 they were rebuilt at the company's Rocksewage Works as 4-4-0, they were never 2-6-0. They were scrapped in 1914.

The position of the injectors was as stated.

Yours faithfully,

Hertford. G. G. WOODCOCK.

Camera Construction

DEAR SIR,—May I add my plea to that of Mr. Andrew Todd's, regarding an article on camera making ?

I have been making ship models for as long as I can remember and have been trying to photograph them for almost as long, usually with hopeless results.

I have now reached the stage where, with the aid of a Kodak +3 Portra attachment fitted to my model " C " Kodak camera (lens to subject distance, 10 in.), I obtain reasonable results but, like Mr. Todd, fail to achieve that crispness of line and clearness of definition so desirable if the prints are for ultimate reproduction.

You, yourselves, as publishers, are always asking for " reproducible " photographs of our work, particulary at exhibition time. Few of us can afford £20 for a ¼-plate camera or, indeed, visits to local photographers whose high prices belie the fact that their photographic experience more often that not stops short at portraits, bare babies and school groups.

If none of your readers can produce an article on constructing a camera solely for photographing models, could you not approach some of the technical staff of one of the big camera firms ?

And please let it be something reasonably simple that the mere woodworker, such as myself, can contrive.

Yours faithfully,

Barton-on-Sea. DONALD MCNARRY.

Turning Points

DEAR SIR,—Mr. D. Wardman's letter in THE MODEL ENGINEER of 1/3/51 brings to my mind a similar experience while I was serving with the Signals in Singapore in 1946.

I was in the light aid detachment workshops R.E.M.E. one day when a jeep was undergoing repairs involving new valve guides which were made in the shops by a Japanese prisoner.

He was given a piece of cast-iron bar about 14 in. long and about 3 in. diameter and he said that he could make the eight from this piece.

This meant quartering the bar along its length and then halving each quarter, and all were curious as to how this should be done and they all expected him to attack the bar with a hacksaw.

He was a bit more canny than that, however. He drilled a row of holes along the length of the bar and across the diameter at the middle, and a crack with a hammer gave him four pieces.

He then mounted each piece under the tool-post of a lathe and with the arbor of the milling machine between centres and a slitting saw, he proceeded to cut each piece in two with no more exertion than the turning of the cross-slide handle, while the whole shop staff looked on with a mixture of envy and admiration and thus the job was done.

Details of the lathe may be of interest, as it was a Japanese lathe, and if I can remember the details, it was about 12 in. centre height and about 6 ft. between centres, its own motor was mounted in the headstock end stand with a three-speed gearbox above it. The headstock was totally enclosed with about three levers for spindle speeds and one for back gear which was arranged with a dog clutch. The bed was a raised three-V and was very accurate.

Another Japanese lathe that I used myself was a copy of a South Bend 6½ in. centre height and 4 ft. between, the same arrangement for drive and speeds.

The apron gear was in the American style with rack and traverse handle on the left, half-nut handle on lower right and self-act handle upper right-raise for cross-feed and lower for traverse.

I got to like this very much, as I could use the left hand for rack-feed (coarse) and the right for cross-feed and top-slide (fine).

I hope these few remarks are of interest, as the feat described certainly gave us something to talk about, and the details of the lathes, I fear, are rather sketchy, but this was over four years ago. I will say this, all machinery that I saw of Japanese origin was excellently made and well fitted, but mostly copies of English or American stuff.

Yours faithfully,

Aldeburgh. E. C. WRIGHT.

Re Electrified Fences

DEAR SIR,—May I point out that a unit constructed as per the diagram by A. B. Scorgie of Aberdeen, would not be a success, as I find after a few swings it settled down to high-speed trembling. I have been experimenting and find this results from similar hook-ups.

But if the points are shifted to the front of armature and projection on flywheel the result is a reliable and self-starting unit, and, in fact, a circuit identical with that used in a patented fence unit supplied by a large and well-known firm.

Yours truly,

Maidstone. CHARLES E. HOOKER.